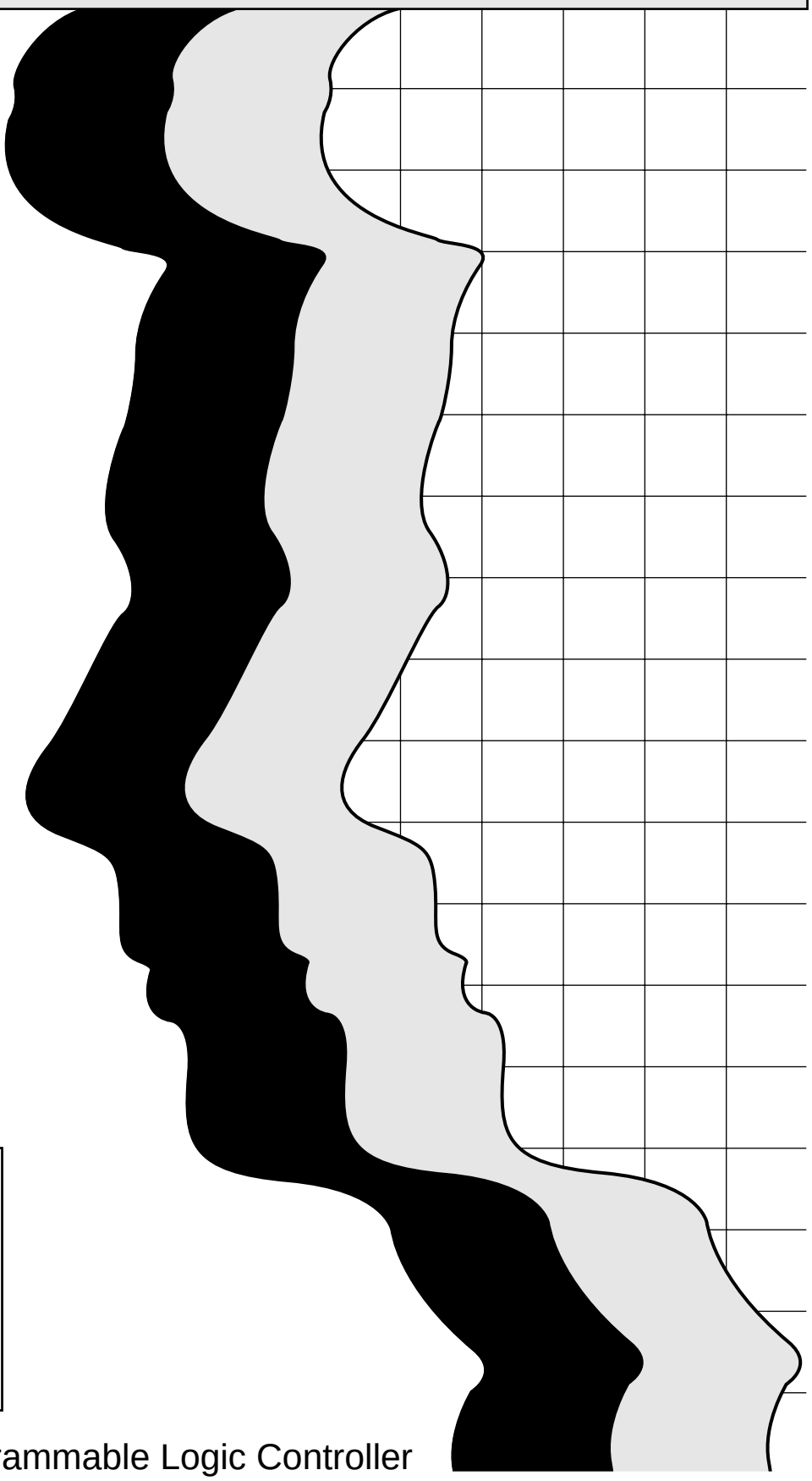
MITSUBISHI

Analog-Digital Converter Module type AJ65SBT-64AD

User's Manual



MELSEC

Mitsubishi Programmable Logic Controller

• SAFETY PRECAUTIONS •

(Always read these precautions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The precautions given in this manual are concerned with this product. Refer to the user's manual of the CPU module to use for a description of the PLC system safety precautions.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

⚠ DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Note that the ⚠CAUTION level may lead to a serious consequence according to the circumstances. Always follow the precautions of both levels because they are important to personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

[Design Precautions]

⚠ DANGER

- When there are communication problems with the data link, the data for the master module will be held.
  Configure an interlocking circuit in a sequence program so that the safety of the overall system is always maintained.

⚠ CAUTION

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other.
  They should be installed 100mm (3.9inch) or more from each other.
  Not doing so could result in noise that would cause erroneous operation.

[Installation Precautions]

⚠ CAUTION
• Use the PLC in the environment that meets the general specifications contained in this Manual. Using the PLC outside the range of the general specifications may result in electric shock, fire or malfunction, or may damage or degrade the module. • Securely fix the module to a DIN rail or with mounting screws, and securely tighten the mounting screws within the specified torque range. Undertightening can cause a drop or malfunction. Overtightening can cause a drop or malfunction due to damage of the screws or module. • Do not touch the conducted area or electric parts of the module. Doing so may cause module malfunctioning or breakdowns.

[Wiring Precautions]

⚠ CAUTION
• Always switch power off externally in all phases before starting installation, wiring and other works. Not doing so can cause the product to be damaged or malfunction. • Always earth the FG and FG1 terminals to the protective earth conductor. Not doing so can cause a malfunction. • Wire the module correctly after confirming the rated voltage and terminal layout of the product. Not doing so can cause a fire or failure. • Tighten the terminal screws within the specified torque range. Undertightening can cause a short circuit or malfunction. Overtightening can cause a short circuit or malfunction due to damage of the screws or module. • Ensure that no foreign matter such as chips and wire-offcuts enter the module. Foreign matter can cause a fire, failure or malfunction.

[Wiring Precautions]

⚠ CAUTION
• When connecting the communication and power supply cables to the module, always run them in conduits or clamp them. Not doing so can damage the module and cables due to loose, moved or accidentally pulled cables or can cause a malfunction due to a cable connection fault. • When disconnecting the communication and power supply cables from the module, do not hold and pull the cable part. Disconnect the cables after loosening the screws in the portions connected to the module. Pulling the cables connected to the module can damage the module and cables or can cause a malfunction due to a cable connection fault.

[Starting and Maintenance Precautions]

⚠ CAUTION
• Do not touch the terminals while the power is on. Doing so may cause malfunctioning. • Always start cleaning or terminal screw retightening after switching power off externally in all phases. Not doing so can cause the module to fail or malfunction. Undertightening can cause a drop, short circuit or malfunction. Overtightening can cause a drop, short circuit or malfunction due to damage of the screws or module. • Never disassemble or modify the module. This may cause breakdowns, malfunctioning, injury and/or fire. • Do not drop the module or give it hard impact since its case is made of resin. Doing so can damage the module. • Mount or dismount the module to or from an enclosure after switching power off externally in all phases. Not doing so can cause the module to fail or malfunction.

[Disposal Precautions]

⚠ CAUTION
• When disposing of this product, treat it as industrial waste.

REVISIONS

* The manual number is given on the bottom left of the back cover.

Print Date	* Manual Number	Revision
Oct., 2000	SH (NA) 080106-A	First printing

Japanese Manual Version SH-080087-A

This manual confers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.

© 2000 MITSUBISHI ELECTRIC CORPORATION

INTRODUCTION

Thank you for choosing a Mitsubishi MELSEC-A Series General Purpose Programmable Controller.
Before using your new PLC, please read this manual thoroughly to gain an understanding of its functions so you can use it properly.

CONTENTS

SAFETY PRECAUTIONS ..... A- 1
REVISIONS ..... A- 4
About Manuals ..... A- 7
Conformation to the EMC Directive and Low Voltage Instruction ..... A- 7
About the Generic Terms and Abbreviations ..... A- 8
Product components ..... A- 9

1. OVERVIEW 1- 1 to 1- 2

1.1 Features 1- 1

2. SYSTEM CONFIGURATION 2- 1 to 2- 2

2.1 Overall Configuration 2- 1
2.2 Applicable System 2- 2

3 SPECIFICATION 3- 1 to 3- 16

3.1 General Specification 3- 1
3.2 Performance Specification 3- 2
3.3 I/O Conversion Characteristics 3- 3
3.3.1 Voltage input characteristics 3- 4
3.3.2 Current input characteristics 3- 5
3.3.3 Relationship between the offset/gain setting and digital output value 3- 6
3.3.4 Accuracy 3- 6
3.3.5 Conversion speed 3- 7
3.4 Function List 3- 8
3.4.1 Sampling processing 3- 9
3.4.2 Moving average processing 3- 9
3.5 Remote I/O Signals 3- 10
3.5.1 Remote I/O signal list 3- 10
3.5.2 Functions of the remote I/O signals 3- 11
3.6 Remote Register 3- 13
3.6.1 Remote register allocation 3- 13
3.6.2 A/D conversion enable/prohibit specification (Address RWwm) 3- 14
3.6.3 Input range setting (Address RWwm+1) 3- 15
3.6.4 Moving average processing count setting (Address RWwm+2) 3- 16
3.6.5 CH. □ Digital output value (Address RWrn to RWrn+3) 3- 16

4 SETUP AND PREPARATION BEFORE OPERATION 4- 1 to 4- 10

4.1 Pre-Operation Procedure 4- 1
4.2 Precautions When Handling 4- 1
4.3 Name of Each Part 4- 3
4.4 Offset/Gain Setting 4- 5
4.5 Station Number Setting 4- 7
4.6 Facing Direction of the Module Installation 4- 7
4.7 Data Link Cable Wiring 4- 8
4.7.1 Instructions for handling the CC-Link dedicated cables 4- 8
4.7.2 Connection of the CC-Link dedicated cables 4- 8
4.8 Wiring 4- 8
4.8.1 Wiring precautions 4- 8
4.8.2 Module connection example 4- 9
4.9 Maintenance and Inspection 4- 9

5 PROGRAMMING 5- 1 to 5- 18

5.1 Programming Procedure 5- 1
5.2 Program Examples 5- 2
5.2.1 Program examples for use of the ACPU/QCPU (A mode) (FROM/TO instructions) 5- 2
5.2.2 Program examples for use of the ACPU/QCPU (A mode) (dedicated instructions) 5- 7
5.2.3 Program examples for use of the QnACPU 5- 12
5.2.4 Program examples for use of the QCPU (Q mode) 5- 15

6 TROUBLESHOOTING 6- 1 to 6- 6

6.1 Using the Remote Input Signals to Check Errors 6- 1
6.2 Using the LED Indications to Check Errors 6- 2
6.3 When the digital output value cannot be read 6- 4
6.4 Troubleshooting for the Case where the "ERR." LED of the Master Station Flickers 6- 5

APPENDIX Appendix- 1 to Appendix- 4

Appendix1 Comparison between This Product and Conventional Product ..... Appendix- 1
Appendix2 External dimension diagram ..... Appendix- 3

About Manuals

The following manuals are also related to this product.
In necessary, order them by quoting the details in the tables below.

Related Manuals

Manual Name	Manual Number (Model Code)
CC-Link System Master/Local Module User's Manual type AJ61BT11/A1SJ61BT11 Describes the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the AJ61BT11 and A1SJ61BT11. (Optionally available)	IB-66721 (13J872)
CC-Link System Master/Local Module User's Manual type AJ61QBT11/A1SJ61QBT11 Describes the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the AJ61QBT11 and A1SJ61QBT11. (Optionally available)	IB-66722 (13J873)
CC-Link System Master/Local Module User's Manual type QJ61BT11 Describes the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the QJ61BT11. (Optionally available)	SH-080016 (13JL91)
Programming Manual type AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode) (Dedicated Instructions) Explains the instructions extended for the AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode). (Optionally available)	IB-66251 (13J742)

Conformation to the EMC Directive and Low Voltage Instruction

When complying with EMC Directives and Low-Voltage Directives by assembling a Mitsubishi PLC compatible with EMC Directive and Low-Voltage Directives into the user product, refer to Chapter 3 "EMC Directives and Low-Voltage Directives" in the User's Manual (Hardware) for the CPU module being used.
The CE logo is printed on the rating plate on the main body of the PLC that conforms to the EMC directive and low voltage instruction.

About the Generic Terms and Abbreviations

Unless otherwise specified, the following generic terms and abbreviations are used in this manual to describe Type AJ65SBT-64AD analog-digital converter module.

Generic Term/Abbreviation	Description
GPPW	Abbreviation for the SW4D5C-GPPW-E or later GPP function software.
ACPU	Generic term for A0J2CPU, A0J2HCPU, A2CPU, A2CPU-S1, A3CPU, A1SCPU, A1SCPU-S1, A1SCPUC-24-R2, A1SHCPU, A1SJCPU, A1SJCPU-S3, A1SJHCPU, A1NCPU, A2NCPU, A2NCPU-S1, A3NCPU, A3MCPU, A3HCPU, A2SCPU, A2SCPU-S1, A2SHCPU, A2SHCPU-S1, A2ACPU, A2ACPU-S1, A3ACPU, A2UCPU, A2UCPU-S1, A2ASCPU, A2ASCPU-S1, A2ASCPU-S30, A2USHCPU-S1, A3UCPU, A4UCPU
QnACPU	Generic term for Q2ACPU, Q2ACPU-S1, Q2ASCPU, Q2ASCPU-S1, Q2ASHCPU, Q2ASHCPU-S1, Q3ACPU, Q4ACPU, Q4ARCPU
QCPU (A mode)	Generic term for Q02CPU-A, Q02HCPU-A, Q06HCPU-A
QCPU (Q mode)	Generic term for Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU
Master station	Station that controls the data link system. One master station is required for each system.
Local station	Station having a PLC CPU and the ability to communicate with the master and other local stations.
Remote I/O station	Remote station that handles bit unit data only. (Performs input and output with external devices.) (AJ65BTB1-16D, AJ65SBTB1-16D)
Remote device station	Remote station that handles bit unit and word unit data only. (Performs input and output with external devices, and analog data exchange.)
Remote station	Generic term for remote I/O station and remote device station. (Controlled by the master station)
Intelligent device station	Station that can perform transient transmission, such as the AJ65BT-R2 (including local stations).
Master module	Generic term for QJ61BT11, AJ61BT11, A1SJ61BT11, AJ61QBT11, and A1SJ61QBT11 when they are used as master stations.
SB	Link special relay (for CC-Link) Bit unit information that indicates the module operating status and data link status of the master station/local station. (Expressed as SB for convenience)
SW	Link special register (for CC-Link) 16 bit unit information that indicates the module operating status and data link status of the master station/local station. (Expressed as SW for convenience)
RX	Remote input (for CC-Link) Information entered in bit units from the remote station to the master station. (Expressed as RX for convenience)
RY	Remote output (for CC-Link) Information output in bit units from the master station to the remote station. (Expressed as RY for convenience)
RWw	Remote register (Write area for CC-Link) Information output in 16-bit units from the master station to the remote device station. (Expressed as RWw for convenience)
RWr	Remote register (Read area for CC-Link) Information entered in 16-bit units from the remote device station to the master station. (Expressed as RWr for convenience)

Product components

This product consists of the following.

Product Name	Quantity
Type AJ65SBT-64AD analog-digital converter module	1
Type AJ65SBT-64AD analog-digital converter module user's manual (hardware)	1

MEMO

1 OVERVIEW

This user's manual explains the specifications, handling, programming methods and others of Type AJ65SBT-64AD analog-digital converter module (hereafter abbreviated to the "AJ65SBT-64AD") which is used as a remote device station of a Control & Communication Link (hereafter abbreviated to "CC-Link") system.
The AJ65SBT-64AD converts the analog signals (voltage or current input) from the PLC's external source to a 16-bit encoded binary data digital value.

1.1 Features

This section gives the features of the AJ65SBT-64AD.

(1) High accuracy

This module performs A/D conversion at the accuracy of ±0.4% relative to the maximum value of the digital output value at the operating ambient temperature of 0 to 55°C, or at ±0.2% relative to the maximum value of the digital output value at the operating ambient temperature of 25±5°C.

(2) Input range selectable per channel

You can choose the analog input range per channel to change the I/O conversion characteristics.

(3) High resolution of 1/±4000

By changing the input range, you can choose and set the digital value resolution to either 1/4000 or 1/±4000 (when the -10 to +10V range or user range setting 1 is selected) to provide high-resolution digital values.

(4) Designation of sampling processing or moving average processing

As a conversion method, you can specify sampling processing or moving average processing per channel.

(5) Smaller than the conventional A/D converter module

This module is 60% smaller in installation area and 38% less in volume than the conventional CC-Link A/D converter module (AJ65BT-64AD).

(6) Up to 42 modules connectable

You can connect up to 42 AJ65SBT-64AD modules to one master station.

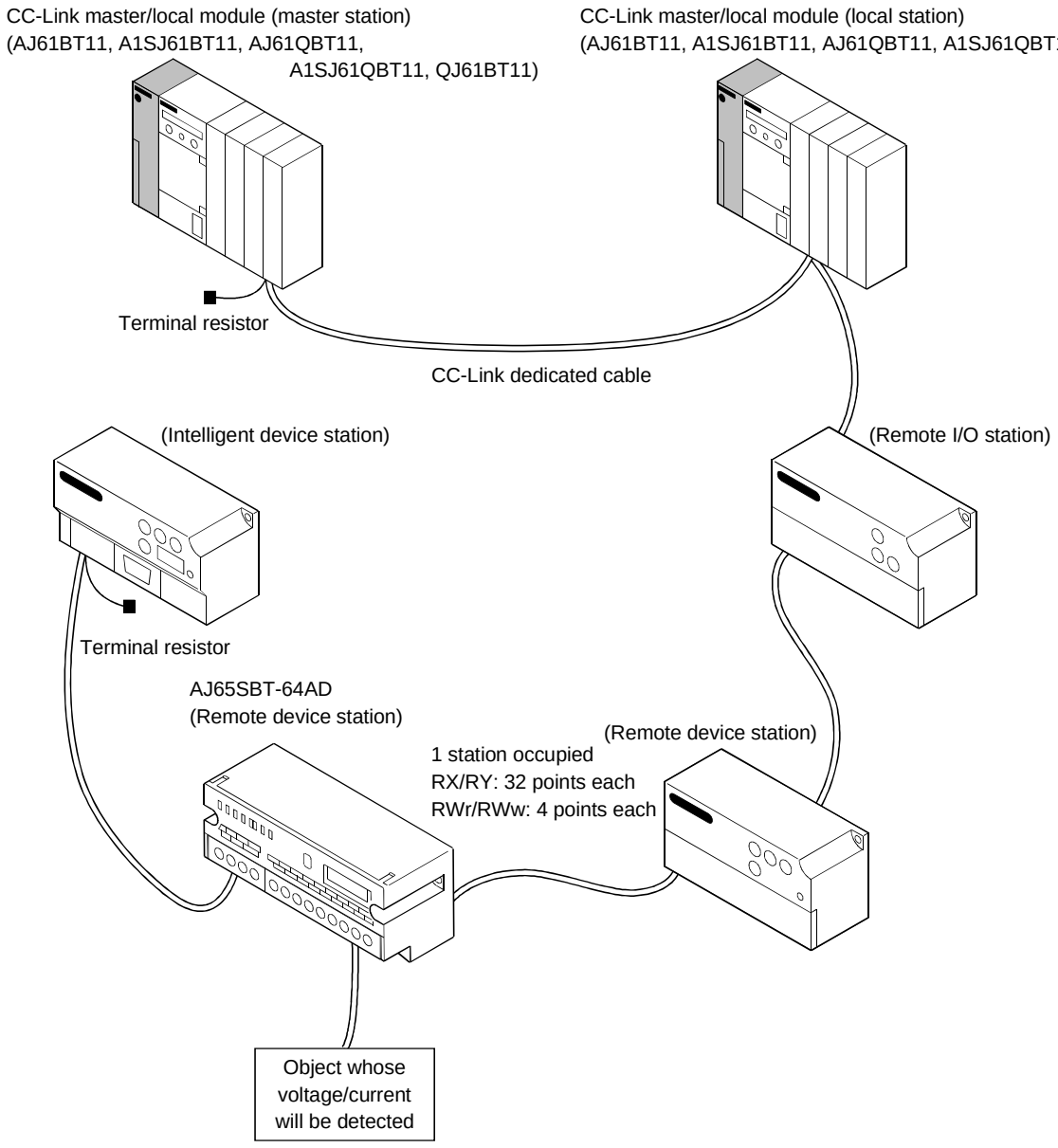
MEMO

2 SYSTEM CONFIGURATION

This chapter describes the system configuration for use of the AJ65SBT-64AD.

2.1 Overall Configuration

The overall configuration for use of the AJ65SBT-64AD is shown below.



2.2 Applicable System

This section explains the applicable system.

(1) Applicable master modules

The following master modules can be used with the AJ65SBT-64AD.

- AJ61BT11
- A1SJ61BT11
- AJ61QBT11
- A1SJ61QBT11
- QJ61BT11

(2) Restrictions on use of CC-Link dedicated instructions

The CC-Link dedicated instructions may not be used depending on the PLC CPU or master module used.
For details of the restrictions, refer to the A series master module user's manual.

3 SPECIFICATION

This chapter provides the specifications of the AJ65SBT-64AD.

3.1 General Specification

Table 3.1 indicates the general specifications of the AJ65SBT-64AD.

Table 3.1 General specification

<table>
<tr><th>Item</th><th colspan="5">Specification</th></tr>
<tr><td>Usage ambient temperature</td><td colspan="5">0 to 55°C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">-20 to 75°C</td></tr>
<tr><td>Usage ambient humidity</td><td colspan="5">10 to 90%RH, no condensation</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="5">10 to 90%RH, no condensation</td></tr>
<tr><td rowspan="9">Vibration durability</td><td rowspan="9">Conforming to JIS B 3501, IEC 1131-2</td><td colspan="4">When there is intermittent vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep count</td></tr>
<tr><td>10 to 57Hz</td><td>—</td><td>0.075mm (0.0030inch)</td><td rowspan="5">10 times in each direction X, Y, Z (80 minutes)</td></tr>
<tr><td>57 to 150Hz</td><td>9.8m/s^2</td><td>—</td></tr>
<tr><td colspan="3">When there is continuous vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td></tr>
<tr><td>10 to 57Hz</td><td>—</td><td>0.035mm (0.0013inch)</td></tr>
<tr><td>57 to 150Hz</td><td>4.9m/s^2</td><td>—</td></tr>
<tr><td>Shock durability</td><td colspan="5">Conforming to JIS B 3501, IEC1131-2 (147m/s^2, 3 times each in 3 directions)</td></tr>
<tr><td>Usage environment</td><td colspan="5">No corrosive gas</td></tr>
<tr><td>Usage height</td><td colspan="5">Less than 2000 m (less than 6562 ft.)</td></tr>
<tr><td>Installation area</td><td colspan="5">Within the control board</td></tr>
<tr><td>Over-voltage category *1</td><td colspan="5">Less than II</td></tr>
<tr><td>Pollution level *2</td><td colspan="5">Less than 2</td></tr>
</table>

*1 Indicates the location where the device is connected from the public cable network to the device structure wiring area.
Category II applies to the devices to which the power is supplied from a fixed equipment.
Surge withstand voltage for devices with up to 300V of rated voltage is 2500V.

*2 This is an index which indicates the degree of conductive object generation in the environment Pollution level 2 is when only non-conductive pollution occurs.
A temporary conductivity caused by condensation must be expected occasionally.

3.2 Performance Specification

Table 3.2 indicates the performance specifications of the AJ65SBT-64AD.

Table 3.2 Performance specification

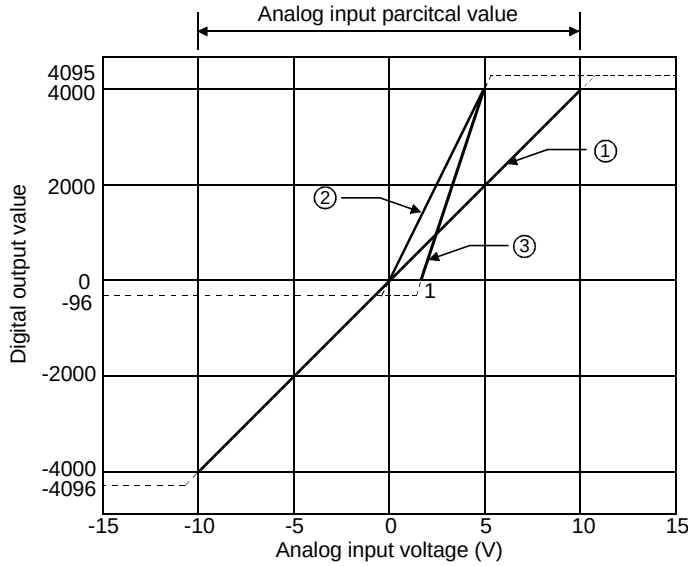
<table>
<tr><th colspan="2">Item</th><th>Specification</th></tr>
<tr><td rowspan="2">Analog input</td><td>Voltage</td><td>DC -10 to +10V (input resistance 1MΩ)</td></tr>
<tr><td>Current</td><td>DC 0 to +20mA (input resistance 250Ω)</td></tr>
<tr><td colspan="2">Digital output</td><td>16-bit signed binary (-4096 to +4095)</td></tr>
<tr><td colspan="2">I/O characteristics, maximum resolution, accuracy (accuracy relative to maximum value of digital output value)</td><td>
<table>
<tr><th rowspan="2"></th><th rowspan="2">Analog input range</th><th rowspan="2">Digital output</th><th colspan="2">Accuracy</th><th rowspan="2">Max. Resolution</th></tr>
<tr><th>Ambient temperature 0 to 55°C</th><th>Ambient temperature 25±5°C</th></tr>
<tr><td rowspan="5">Voltage</td><td>-10 to +10V</td><td rowspan="2">-4000 to +4000</td><td rowspan="8">±0.4% (±16 digit*)</td><td rowspan="8">±0.2% (±8 digit*)</td><td>2.5mV</td></tr>
<tr><td>User range setting 1 (-10 to +10V)</td><td>1.25mV</td></tr>
<tr><td>0 to 5V</td><td rowspan="3">0 to 4000</td><td rowspan="3">1.0mV</td></tr>
<tr><td>1 to 5V</td></tr>
<tr><td>User range setting 2 (0 to 5V)</td></tr>
<tr><td rowspan="3">Current</td><td>0 to 20mA</td><td rowspan="3">0 to 4000</td><td>5μA</td></tr>
<tr><td>4 to 20mA</td><td rowspan="2">4μA</td></tr>
<tr><td>User range setting 3 (0 to 20mA)</td></tr>
</table>
* : digit indicates digital value.
Factory setting is -10 to +10V.
</td></tr>
<tr><td colspan="2">Maximum conversion speed</td><td>1ms/1 channel.</td></tr>
<tr><td colspan="2">Absolute maximum input</td><td>Voltage ±15 V, current ±30mA</td></tr>
<tr><td colspan="2">Analog input points</td><td>4 channels/1module</td></tr>
<tr><td colspan="2">Number of occupied stations</td><td>1 station (RX/RY: each 32 points, RWr/RWw: each 4 points)</td></tr>
<tr><td colspan="2">Connected terminal block</td><td>7-point, 2-piece terminal block (transmission, power supply)
Direct-coupled, 18-point terminal block (analog input section) (M3 screw)</td></tr>
<tr><td colspan="2">Applicable wire size</td><td>0.3 to 0.75mm^2</td></tr>
<tr><td colspan="2">Applicable crimping terminal</td><td>RAV1.25-3.5 (conforming to JIS C2805)</td></tr>
<tr><td colspan="2">Module mounting screw</td><td>M4 screw × 0.7mm × 16mm or more (tightening torque range: 78 to 108N•cm)
Can also be mounted to DIN rail</td></tr>
<tr><td colspan="2">Supported DIN rail</td><td>TH35-7.5Fe, TH35-7.5Al (conforming to JIS-C2B12)</td></tr>
<tr><td colspan="2" rowspan="2">External power supply</td><td>DC24V (DC20.4V to DC26.4V)</td></tr>
<tr><td>Inrush current :8.5A, within 2.3ms</td></tr>
<tr><td colspan="2">24VDC internal current consumption (A)</td><td>0.090</td></tr>
<tr><td colspan="2">Noise immunity</td><td>By noise simulator of 500Vp-p noise voltage, 1μs noise width and 25 to 60Hz noise frequency</td></tr>
<tr><td colspan="2">Dielectric withstand voltage</td><td>Between power supply/communication system batch and analog input batch: 500VAC, 1 minute</td></tr>
<tr><td colspan="2">Isolation system</td><td>Across communication system terminals and all analog input terminals: Photocoupler isolated
Across power supply system terminals and all analog input terminals: Photocoupler isolated
Across channels: Non-isolated</td></tr>
<tr><td colspan="2">Weight (kg)</td><td>0.20</td></tr>
<tr><td colspan="2">Outline dimensions (mm)</td><td>118 (W) × 50 (H) × 40 (D)</td></tr>
</table>

3.3 I/O Conversion Characteristics

The I/O characteristics is the slope created by connecting the offset and gain values, with a straight line when converting the analog signals (voltage or current input) from an external source of the PLC to digital values.
The offset value is an analog input value (voltage or current) at which the digital output value is 0.
The gain value is an analog input value (voltage or current) at which the digital output value is 4000.

3.3.1 Voltage input characteristics

The voltage input characteristic graph is shown below.



Number	Analog Input Range Setting	Offset Value	Gain Value	Digital Output Value*	Maximum Resolution
1)	-10 to +10V	0V	10V	-4000 to +4000	2.5mV
2)	0 to 5V	0V	5V	0 to 4000	1.25mV
3)	1 to 5V	1V	5V		1.0mV
—	User range setting 1 (-10 to +10V)	0V	10V	-4000 to +4000	2.5mV
—	User range setting 2 (0 to 5V)	0V	5V	0 to 4000	1.0mV

Fig. 3.1 Voltage Input Characteristic

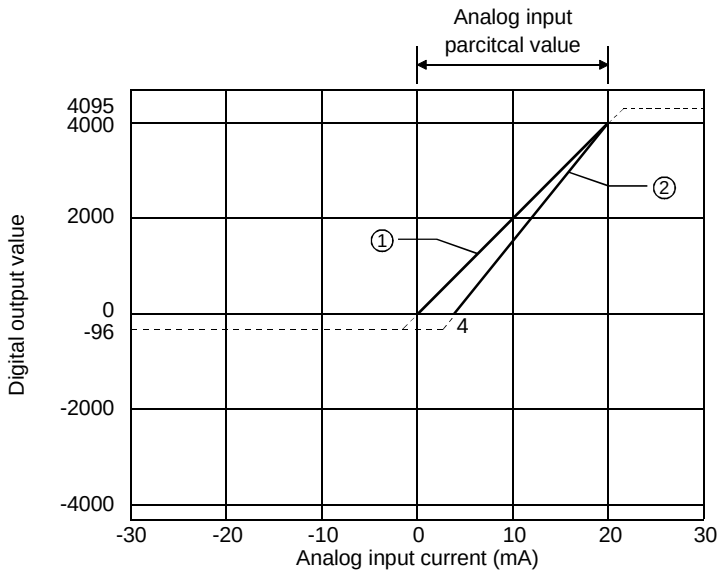
POINT

(1) Do not input more than ±15V. The element may be damaged.
(2) If the analog input provided corresponds to the digital output value* beyond its range, the digital output value is fixed to the maximum or minimum.
  • For 0 to 4000, the digital output value is within the range -96 to 4095.
  • For -4000 to +4000, the digital output value is within the range -4096 to +4095.
(3) Within the analog input and digital output scopes of each input range, the maximum resolution and accuracy are within the performance specification range. Outside those scopes, however, they may not fall within the performance specification range. (Avoid using the dotted line part in Fig. 3.1.)
(4) Set the offset and gain values of the user range setting within the range satisfying the following conditions.
  (a) Setting range when user range setting 1 is selected: -10 to +10V
  (b) Setting range when user range setting 2 is selected: 0 to 5V
  (c) (Gain value) > (Offset value)

  If you attempt to make setting outside the setting range of (a) or (b), the "RUN" LED flickers at 0.5s intervals.
  Set the values within the setting range.
  If you attempt to make setting outside the setting range of (c), the "RUN" LED flickers at 0.5s intervals.
  Make setting again.

3.3.2 Current input characteristics

The current input characteristic graph is shown below.



Number	Analog Input Range Setting	Offset Value	Gain Value	Digital Output Value*	Maximum Resolution
1)	0 to 20mA	0mA	20mA	0 to 4000	5μA
2)	4 to 20mA	4mA	20mA		4μA
—	User range setting 3 (0 to 20mA)	0mA	20mA		

Fig. 3.2 Current Input Characteristic

POINT

(1) Do not input more than ±30mA. A breakdown may result due to heat increase.
(2) If the analog input provided corresponds to the digital output value* beyond its range, the digital output value is fixed to the maximum or minimum.
  • For 0 to 4000, the digital output value is within the range -96 to 4095.
(3) Within the analog input and digital output scopes of each input range, the maximum resolution and accuracy are within the performance specification range. Outside those scopes, however, they may not fall within the performance specification range. (Avoid using the dotted line part in Fig. 3.2.)
(4) Set the offset and gain values of the user range setting within the range satisfying the following conditions.
  (a) Setting range when user range setting 3 is selected: 0 to 20mA
  (b) (Gain value) > (Offset value)

  If you attempt to make setting outside the setting range of (a), the "RUN" LED flickers at 0.5s intervals.
  Set the values within the setting range.
  If you attempt to make setting outside the setting range of (b), the "RUN" LED flickers at 0.5s intervals.
  Make setting again.

3.3.3 Relationship between the offset/gain setting and digital output value

The relationship between the offset/gain setting and digital output value is described.

(1) Resolution

The resolution is obtained by the following formula:

(a) For the voltage input:

$$\text{Resolution} = \frac{\text{(Gain value) - (Offset value)}}{4000}$$

(b) For the current input:

$$\text{Resolution} = \frac{\text{(Gain value) - (Offset value)}}{4000}$$

(2) Relationship between the maximum resolution and digital output value

The maximum resolution of the AJ65SBT-64AD is as indicated in the performance specification.

If the following is satisfied from the offset/gain setting, the digital output value does not increases /decreases by one.

$$\frac{\text{(Gain value) - (Offset value)}}{4000} < \text{Maximum resolution}$$

3.3.4 Accuracy

Accuracy is relative to the maximum value of the digital output value.

If you change the offset/gain setting or input range to change the input characteristic, accuracy does not change and is held within the range indicated in the performance specifications.

Accuracy is within ±0.2% (±8 digit) at the operating ambient temperature of 25±5°C or within ±0.4% (±16 digit) at the operating ambient temperature of 0 to 55°C.

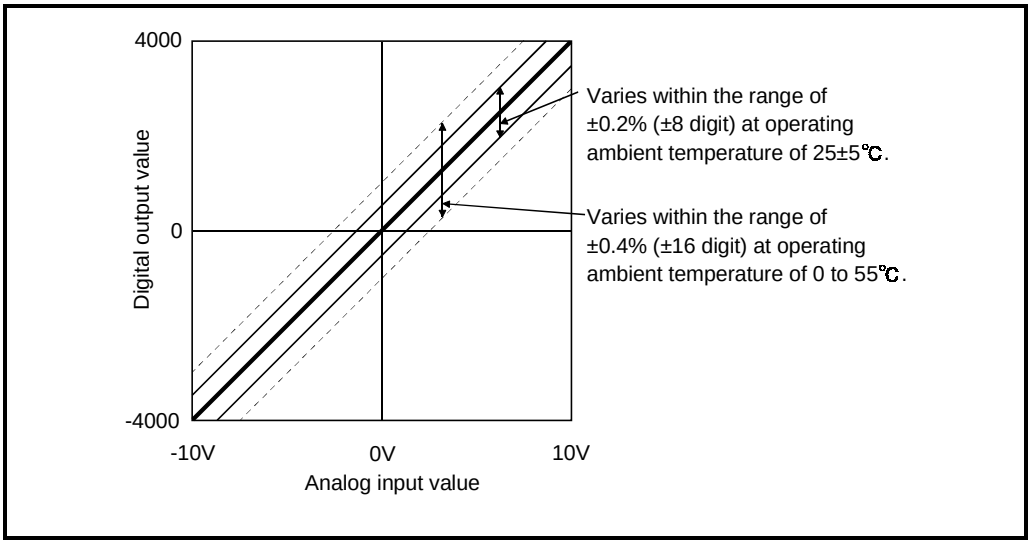


Fig. 3.3 Voltage Input Characteristic Accuracy

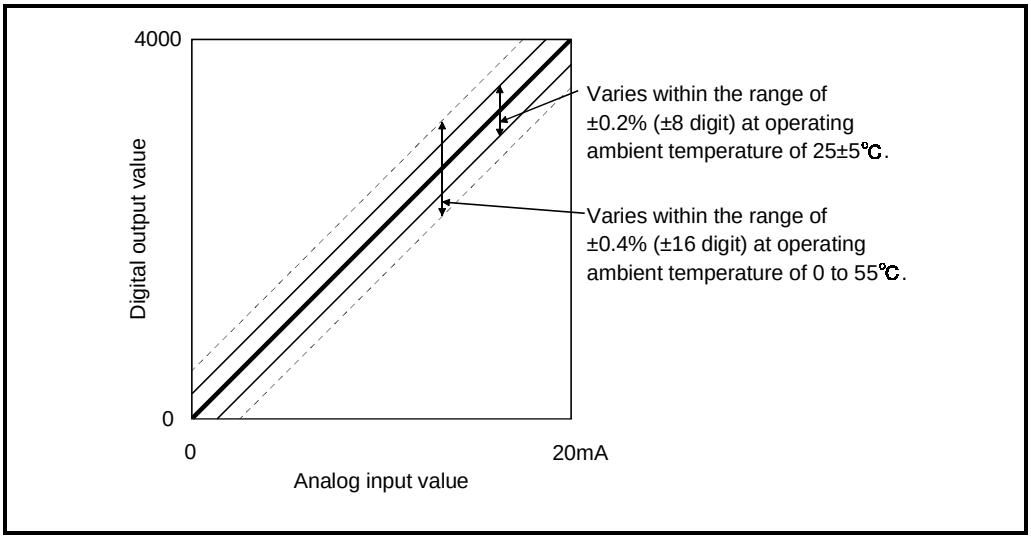


Fig. 3.4 Current Input Characteristic Accuracy

3.3.5 Conversion speed

Conversion speed indicates time from channel changing to A/D conversion completion.
Conversion speed per channel of the AJ65SBT-64AD is 1ms.
Due to the data link processing time of the CC-Link system, there is a transmission delay until the A/D conversion value is read actually.
For the data link processing time, refer to the user's manual of the master module used.

Example) Data link processing time taken when the master module is the AJ61BT11 or A1SJ61BT11

[Calculation expression]

SM+LS×2+remote device station processing time
SM: Scan time of master station sequence program
LS : Link scan time
Remote device station processing time: (Number of channels used+1*) × 1ms
*: Internal processing time of AJ65SBT-64AD

3.4 Function List

The AJ65SBT-64AD function list is shown in table 3.3.

Table 3.3 AJ65SBT-64AD function list

<table>
<tr><th>Item</th><th>Description</th><th>Refer to</th></tr>
<tr><td>Sampling processing</td><td>Perform A/D conversion of an analog input value one by one and store the result into the remote register each time.</td><td>Section 3.4.1
Section 3.5.2</td></tr>
<tr><td>Moving average processing</td><td>Average the digital output values of the specified count measured per sampling time.</td><td>Section 3.4.2
Section 3.5.2
Section 3.6.4</td></tr>
<tr><td>A/D conversion enable/prohibit specification</td><td>Specify whether A/D conversion is enabled or disabled per channel.
By prohibiting the conversion for the channels which are not used, the sampling time can be shortened.</td><td>Section 3.6.2</td></tr>
<tr><td>Input range changing function</td><td>Can set the analog input range per channel to change the I/O conversion characteristics.
Select the input range setting from among the following 8 types.
<table>
<tr><th>Input Range</th><th>Set Value</th></tr>
<tr><td>-10 to +10V</td><td>0H</td></tr>
<tr><td>0 to 5V</td><td>1H</td></tr>
<tr><td>1 to 5V</td><td>2H</td></tr>
<tr><td>0 to 20mA</td><td>3H</td></tr>
<tr><td>4 to 20mA</td><td>4H</td></tr>
<tr><td>User range setting 1 (-10 to +10V)</td><td>5H</td></tr>
<tr><td>User range setting 2 (0 to 5V)</td><td>6H</td></tr>
<tr><td>User range setting 3 (0 to 20mA)</td><td>7H</td></tr>
</table></td><td>Section 3.6.3</td></tr>
<tr><td>Offset/gain setting</td><td>The offset/gain setting can be performed volumeless for each channel, and the I/O conversion characteristics can be changed.</td><td>Section 4.4</td></tr>
</table>

3.4.1 Sampling processing

The A/D conversion is performed successively for the analog input, and the converted digital output values are stored in the remote register.
The processing time to store the digital output value into the remote register after the sampling processing differs depending on the number of A/D conversion enabled channels.

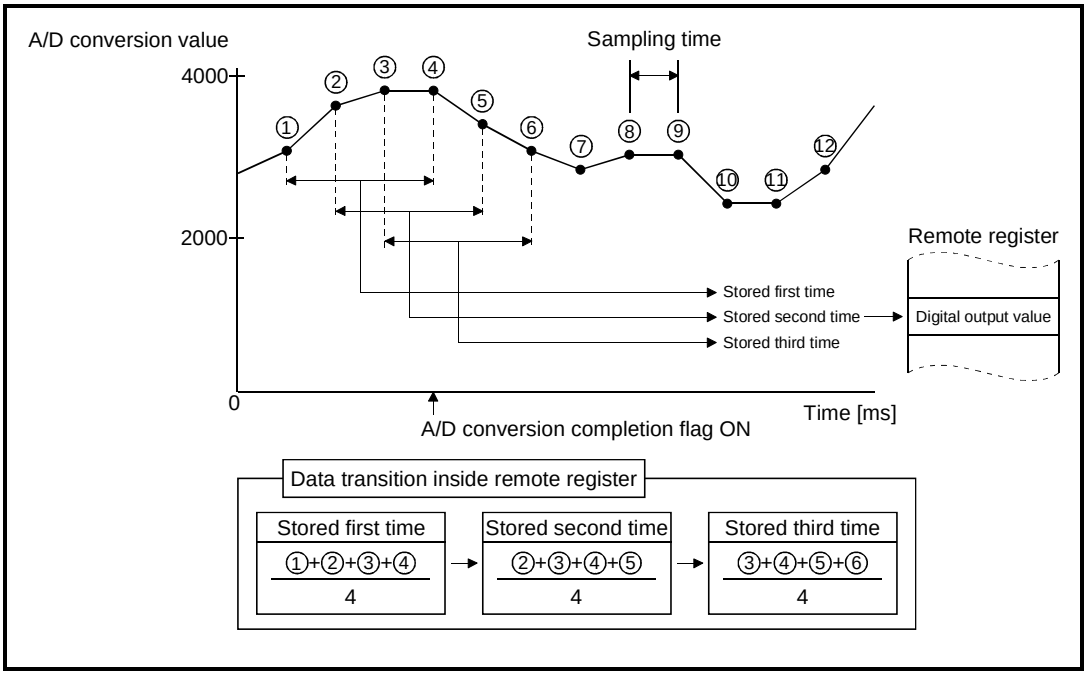
(Processing time) = Number of A/D conversion enabled channels) × 1 (ms)
↑
Maximum conversion speed

[Example] When three channels, channels 1, 2, and 3 are enabled for conversion:
3×1 = 3 (ms)

3.4.2 Moving average processing

The specified count of digital output values imported per sampling time are averaged to find a value, which is then stored into the remote register.
Since average processing is performed with data shifted per sampling, the most recent digital output value is available.
Average processing can be performed without changing the conversion speed.
Use moving average processing count setting (address RWwm+2) to set the number of moving average processings.
The count can be selected from among four types: 4, 8, 16 and 32 times.

Moving average processing at the count setting of 4 times



3.5 Remote I/O Signals

This section describes the assignment and functions of the remote I/O signals.

3.5.1 Remote I/O signal list

Remote inputs (RX) mean the input signals from the AJ65SBT-64AD to the master module, and remote outputs (RY) mean the output signals from the master module to the AJ65SBT-64AD.
In communications with the master station, the AJ65SBT-64AD uses 32 points of the remote inputs (RX) and 32 points of the remote outputs (RY). Table 3.4 indicates the assignment and names of the remote I/O signals.

Table 3.4 Remote I/O Signals List

Signal direction: AJ65SBT-64AD → Master Module		Signal direction: Master Module → AJ65SBT-64AD	
Remote input (RX)	Signal name	Remote output (RY)	Signal name
RXn0	CH.1 A/D conversion completion flag	RYn0	CH.1 moving average processing specifying flag
RXn1	CH.2 A/D conversion completion flag	RYn1	CH.2 moving average processing specifying flag
RXn2	CH.3 A/D conversion completion flag	RYn2	CH.3 moving average processing specifying flag
RXn3	CH.4 A/D conversion completion flag	RYn3	CH.4 moving average processing specifying flag
RXn4	CH.1 range error flag	RYn4 to RY(n+1)7	Reserved
RXn5	CH.2 range error flag		
RXn6	CH.3 range error flag		
RXn7	CH.4 range error flag		
RXn8 to RXnB	Reserved		
RXnC	E^2PROM write error flag		
RXnD	Reserved		
RXnE			
RXnF	Test mode flag		
RX(n+1)0 to RX(n+1)7	Reserved		
RX(n+1)8	Initial data processing request flag	RY(n+1)8	Initial data processing completion flag
RX(n+1)9	Initial data setting completion flag	RY(n+1)9	Initial data setting request flag
RX(n+1)A	Error status flag	RY(n+1)A	Error reset request flag
RX(n+1)B	Remote READY	RY(n+1)8 to RY(n+1)F	Reserved
RX(n+1)C to RX(n+1)F	Reserved		

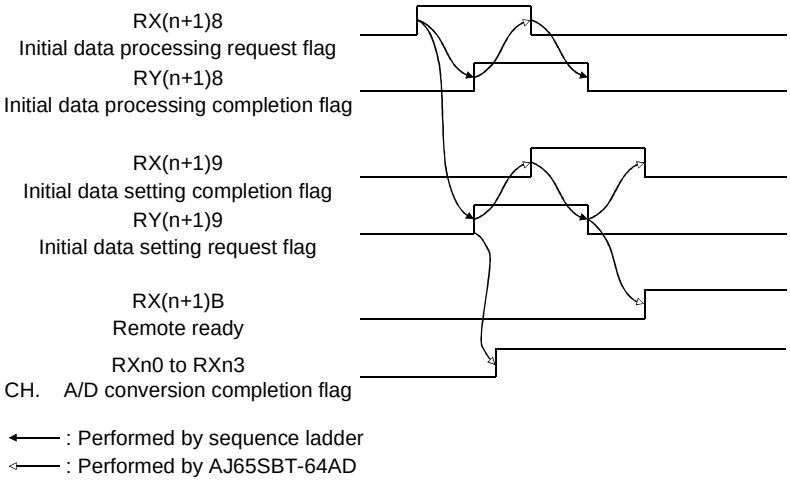
POINT

The reserved devices given in Table 3.4 are used by the system and cannot be used by the user.
If the user has used (turned on/off) any of them, we cannot guarantee the functions of the AJ65SBT-64AD.

3.5.2 Functions of the remote I/O signals

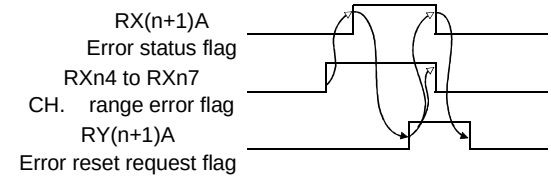
Table 3.5 explains the functions of the remote I/O signals of the AJ65SBT-64AD.

Table 3.5 Remote I/O Signal Details (1/2)

Device No.	Signal Name	Description
RXn0 to RXn3	CH.□ A/D Conversion completion flag	The A/D conversion completion flag turns on at completion of the A/D conversion of the corresponding channel when the initial data setting request flag (RY(n+1)9) turns from off to on after power-on. The A/D conversion completion flag processing is processed only once when the A/D conversion enable/prohibit specification is changed. • When changing the A/D conversion from prohibit to enable: When the average processing is specified, the flag turns on after completing the average processing of the number of times or time, and storing the A/D conversion digital value in the remote register. • When changing the A/D conversion from enable to prohibit: The corresponding channel's A/D conversion completion flag turns off.
RXn4 to RXn7	CH. □ range error flag	Turns on when the value set for input range setting is outside the setting range. Turns on if all channels are not set to any of "user range settings 1 to 3" at offset/gain setting (in the test mode).
RXnC	E^2PROM write error flag	Turns on if the number of E^2PROM write times exceeds its limit (100,000 times per channel). If this flag has turned on, this module itself has failed (hardware fault) and therefore this flag cannot be reset (turned off) by the error reset request flag.
RXnF	Test mode flag	Turns on in the test mode. (Used for interlock to prevent wrong output during offset/gain setting.)
RX(n+1)8	Initial data processing request flag	After power-on, the initial data processing request flag is turned on by the AJ65SBT-64AD to request the initial data to be set. Also, after the initial data processing is complete (initial data processing completion flag RY(n+1)8 ON), the flag is turned off.  ←— : Performed by sequence ladder ◁— : Performed by AJ65SBT-64AD
RX(n+1)9	Initial data setting completion flag	When the initial data setting request (RY(n+1)9 ON) is made, the flag turns on after the initial data setting completion is done. Also, after the initial data setting is complete, the initial data setting completion flag turns off when the initial data setting request flag turns off.

n: Address allocated to the master module by the station number setting.

Table 3.5 Remote I/O Signal Details (2/2)

Device No.	Signal Name	Description
RX(n+1)A	Error status flag	Turns on when CH. □ range error flag (RXn4 to RXn7) or E^2PROM write error flag (RXnC) has turned on. Does not turn on at occurrence of the watchdog timer error. ("RUN" LED goes off.)  ⟵ : Performed by sequence ladder ⟵ : Performed by AJ65SBT-64AD
RX(n+1)B	Remote READY	Turns on when initial data setting is completed after power-on or at termination of the test mode. (Used for interlocking read/write from/to the master module.)
RYn0 to RYn3	CH. □ moving average processing specifying flag	Set the A/D conversion system to sampling processing or moving average processing per channel. Made valid on the leading edge of the initial data processing completion flag (RY(n+1)8) or initial data setting request flag (RY(n+1)9). OFF: Sampling processing ON: Moving average processing
RY(n+1)8	Initial data processing completion flag	Turns on after initial data processing completion when initial data processing is requested after power-on or test mode operation.
RY(n+1)9	Initial data setting request flag	Turns on at the time of initial data setting or changing.
RY(n+1)A	Error reset request flag	When this flag turns on, the CH. □ range error flag (RXn4 to RXn7) is reset (turned off) and the error status flag (RX(n+1)A) is also reset, but the E^2PROM write error flag (RXnC) cannot be rest and therefore the error status flag remains on.

n: Address allocated to the master module by the station number setting.

3.6 Remote Register

The AJ65SBT-64AD has a remote resister for data communication with the master module. The remote register allocation and data structures are described.

3.6.1 Remote register allocation

The remote register allocation is shown in Table 3.6.

Table 3.6 Remote register allocation

Communication direction	Address	Description	Default value	Reference section
Master → Remote	RWwm	A/D conversion enable/prohibit specification	0	Section 3.6.2
	RWwm+1	Input range setting	0	Section 3.6.3
	RWwm+2	Moving average processing count setting	0	Section 3.6.4
	RWwm+3	Reserved	0	——
Remote → Master	RWrn	CH.1 digital output value	0	Section 3.6.5
	RWrn+1	CH.2 digital output value	0	
	RWrn+2	CH.3 digital output value	0	
	RWrn+3	CH.4 digital output value	0	

m, n: Address allocated to the master module by the station number setting.

POINT

Do not read or write data from or to the reserved area of the remote register. If data is read or written, we cannot guarantee the functions of the AJ65SBT-64AD.

3.6.2 A/D conversion enable/prohibit specification (Address RWwm)

(1) Set whether A/D conversion is enabled or disabled per channel.

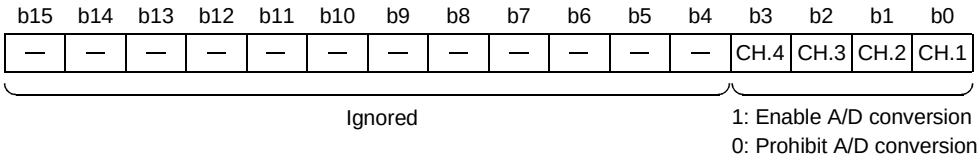
(2) By setting the unused channels to conversion prohibit, the sampling cycle can be shortened.

Example) The sampling cycle when only channels 1 and 3 are set to A/D conversion enabled:

2 (Number of channels enabled) × 1ms (Conversion speed at one channel) = 2ms

(3) Operation is performed according to the setting made for the leading edges of initial data setting request flag (RY(n+1)9).

(4) The default setting is A/D conversion disable for all channels.



3.6.3 Input range setting (Address RWwm+1)

(1) Set the analog input range per channel.

(2) Operation is performed according to the setting made for the leading edges of the initial data setting request flag (RY(n+1)9).

(3) The default setting is -10 to +10V for all channels.

b15 to b12	b11 to b8	b7 to b4	b3 to b0
CH.4	CH.3	CH.2	CH.1

Input Range	Set Value
-10 to +10V	0H
0 to 5V	1H
1 to 5V	2H
0 to 20mA	3H
4 to 20mA	4H
User range setting 1 (-10 to +10V)	5H
User range setting 2 (0 to 5V)	6H
User range setting 3 (0 to 20mA)	7H

(4) When making offset/gain setting, set all channels to any of "user range settings 1 to 3".
Setting any other range will result in an error and flicker the "RUN" LED at 0.1s intervals.

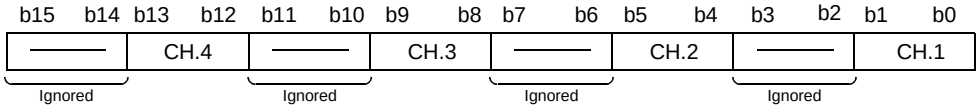
3.6.4 Moving average processing count setting (Address RWwm+2)

(1) Set the average processing count of the channel for which moving average processing has been specified in the CH. □ moving average processing specifying flag (RYn0 to RYn3).

(2) Sampling processing is performed for the channel whose CH. □ moving average processing specifying flag (RYn0 to RYn3) was not turned on, independently of the moving average processing count setting.

(3) Operation is performed according to the setting made for the leading edges of the initial data setting request flag (RY(n+1)9).

(4) The default setting is 4 times for all channels.
Bits b2, b3, b6, b7, b10, b11, b14 and b15 are ignored.

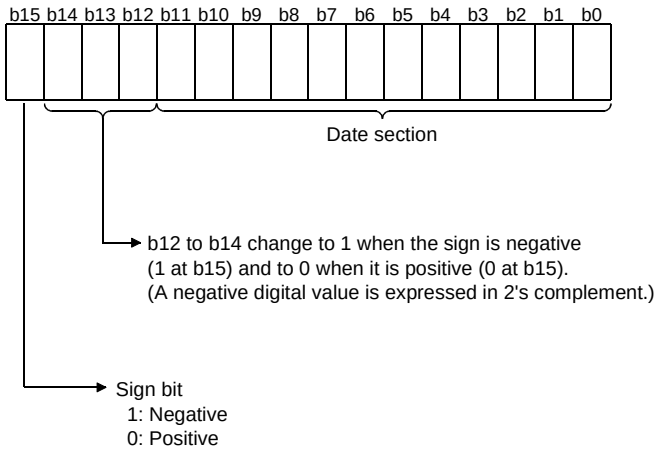


Set Count	Set Value
4 times	0H
8 times	1H
16 times	2H
32 times	3H

3.6.5 CH. □ Digital output value (Address RWrn to RWrn+3)

(1) The digital value after the A/D conversion is stored in the remote register address from RWrn to RWrn+3 for each channel.

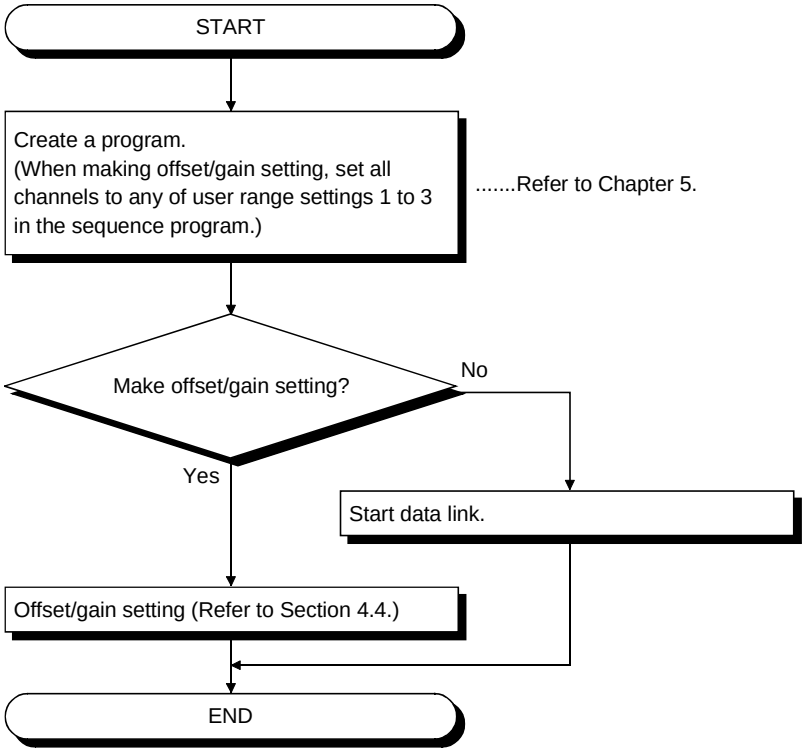
(2) The digital output value is expressed in a 16-bit encoded binary.



4 SETUP AND PREPARATION BEFORE OPERATION

4.1 Pre-Operation Procedure

This section explains the preparatory procedure for operating the AJ65SBT-64AD.



4.2 Precautions When Handling

The precautions when handling the AJ65SBT-64AD are described below:

⚠CAUTION

- Do not touch the terminals while power is on. Doing so can cause a malfunction.
- Ensure that no foreign matter such as chips and wire-offcuts enter the module. Foreign matter can cause a fire, failure or malfunction.
- Do not disassemble or modify the module. Doing so can cause a failure, malfunction, injury or fire.
- Do not touch the conductive and electronic parts of the module directly. Doing so can cause the module to malfunction or fail.
- Do not drop the module or give it hard impact since its case is made of resin. Doing so can damage the module.
- Do not touch the conductive parts of the module directly. Doing so can cause the module to malfunction or fail.
- Tighten the terminal screws within the specified torque range. Undertightening can cause a short circuit or malfunction. Overtightening can cause a short circuit or malfunction due to damage of the screws or module.

⚠CAUTION

- Dispose of the product as industrial waste.
- Use the module in the environment indicated in the general specifications given in this manual.
  Not doing so can cause an electric shock, fire, malfunction, product damage or deterioration.
- Securely fix the module to a DIN rail or with mounting screws, and securely tighten the mounting screws within the specified torque range.
  Undertightening can cause a drop or malfunction.
  Overtightening can cause a drop or malfunction due to damage of the screws or module.
- Mount or dismount the module to or from an enclosure after switching power off externally in all phases. Not doing so can cause the module to fail or malfunction.

(1) Perform the tightening of the module installation screws and terminal screws in the following range.

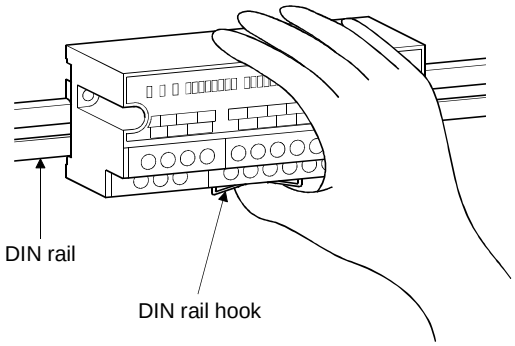
Screw Location	Tightening Torque Range
Module mounting screw (M4 screw)	78 to 108N•cm
Terminal block terminal screw (M3 screw)	59 to 88N•cm
Terminal block mounting screw (M3.5 screw)	68 to 98N•cm

(2) When using the DIN rail adapter, install the DIN rail by making sure of the following:

(a) Applicable DIN rail models (conforming to the JIS-C2B12)
TH35-7.5Fe
TH35-7.5Al

(b) DIN rail installation screw interval
When installing the DIN rail, tighten the screws with less than 200mm (7.87 inch) pitches.

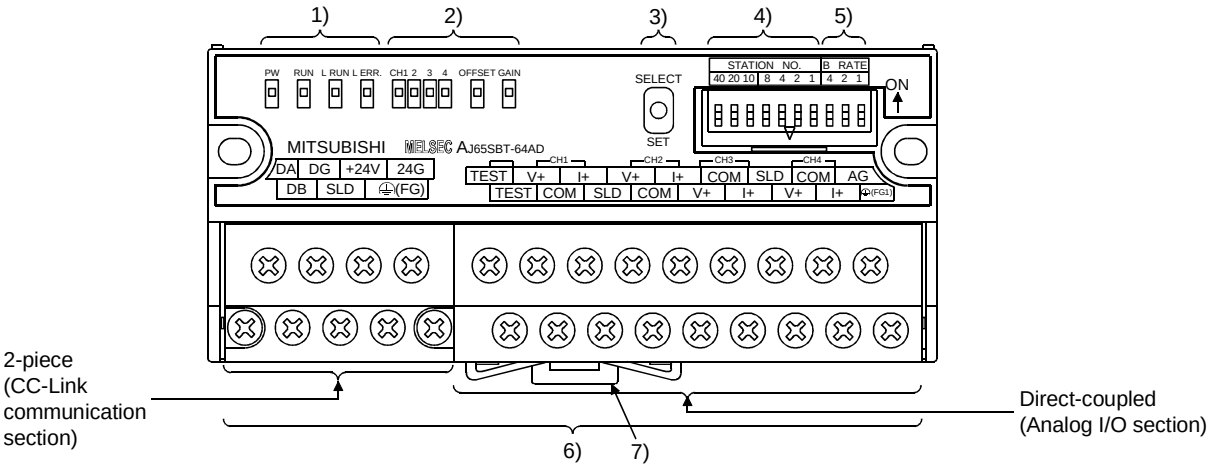
(3) When mounting the AJ65SBT-64AD to the DIN rail, press with your finger the centerline of the DIN rail hook at the bottom of the module until it clicks.



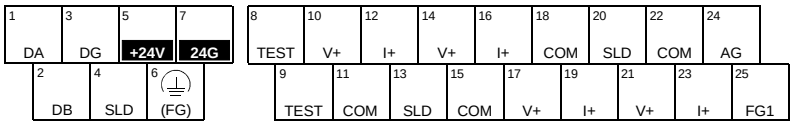
(4) Refer to the Master Module user's manual for the name, specification, and manufacturers of supported cables for the use with AJ65SBT-64AD.

4.3 Name of Each Part

The name of each part in the AJ65SBT-64AD is shown.



[Terminal numbers and signal names]

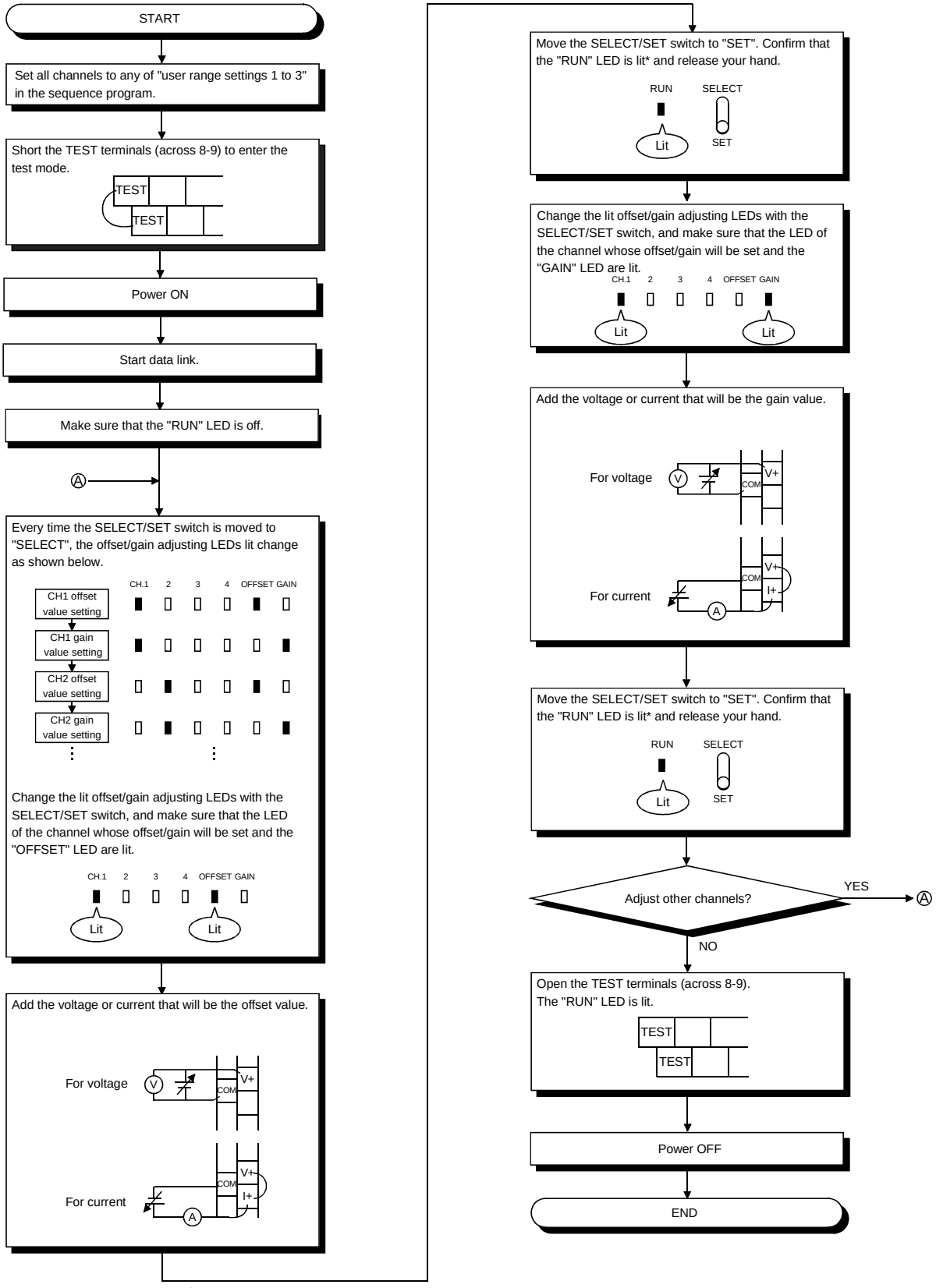


Number	Name and appearance	Description		
1)	Operation status display LED	PW LED	ON : Power supply on OFF: Power supply off	
		RUN LED	Normal mode	On : Normal operation Flashing : 0.1s intervals indicate an input range setting error. Off : 24VDC power supply shutoff or watchdog timer error occurred.
			Test mode	On : Indicates that the SELECT/SET switch is in the SET position. Flashing : 0.1s intervals indicate that the input range setting is not any of "user range settings 1 to 3". 0.5s intervals indicate that you attempted to make offset/gain setting outside the setting range. Off : Indicates that the SELECT/SET switch is in the SELECT or center position.
		L RUN LED	On : Normal communication Off : Communication cutoff (time expiration error)	
		L ERR. LED	On : Indicates that transmission speed setting or station number setting is outside the range. Flicker at fixed intervals : Indicates that transmission speed setting or station number setting was changed from that at power-on. Flicker at unfixed intervals : Indicates that you forgot fitting the termination resistor or the module or CC-Link dedicated cable is affected by noise. Off : Indicates normal communications.	
2)	Offset/gain adjusting LEDs	CH□ OFFSET GAIN	Normal mode	Normally OFF.
			Test mode	The LEDs lit change every time the SELECT/SET switch is moved to SELECT. (Refer to Section 4.4.)
3)	SELECT/SET switch	Used to make offset/gain setting in the test mode.		

<table>
<tr><th>Number</th><th>Name and appearance</th><th>Description</th></tr>
<tr><td>4)</td><td>Station number setting switches</td><td>
Use the switches in STATION NO. "10", "20" and "40" to set the tens of the station number.
Use the switches in STATION NO. "1", "2", "4" and "8" to set the units of the station number.
The switches are all factory-set to OFF.
Always set the station number within the range 1 to 64.
Setting any other number than 1 to 64 will result in an error, flickering the "L ERR." LED.
You cannot set the same station number to two or more stations.
<table>
<tr><th rowspan="2">Station Number</th><th colspan="3">Tens</th><th colspan="4">Units</th></tr>
<tr><th>40</th><th>20</th><th>10</th><th>8</th><th>4</th><th>2</th><th>1</th></tr>
<tr><td>1</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td></tr>
<tr><td>2</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td></tr>
<tr><td>3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>4</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>:</td><td>:</td><td>:</td><td>:</td><td>:</td><td>:</td><td>:</td><td>:</td></tr>
<tr><td>10</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>11</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td></tr>
<tr><td>:</td><td>:</td><td>:</td><td>:</td><td>:</td><td>:</td><td>:</td><td>:</td></tr>
<tr><td>64</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
</table>
(Example) To set the station number to "32", set the switches as indicated below.
<table>
<tr><th rowspan="2">Station Number</th><th colspan="3">Tens</th><th colspan="4">Units</th></tr>
<tr><th>40</th><th>20</th><th>10</th><th>8</th><th>4</th><th>2</th><th>1</th></tr>
<tr><td>32</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td></tr>
</table>
</td></tr>
<tr><td>5)</td><td>Transmission speed setting switches</td><td>
<table>
<tr><th rowspan="2">Set Value</th><th colspan="3">Setting Switches</th><th rowspan="2">Transmission Speed</th></tr>
<tr><th>4</th><th>2</th><th>1</th></tr>
<tr><td>0</td><td>OFF</td><td>OFF</td><td>OFF</td><td>156kbps</td></tr>
<tr><td>1</td><td>OFF</td><td>OFF</td><td>ON</td><td>625kbps</td></tr>
<tr><td>2</td><td>OFF</td><td>ON</td><td>OFF</td><td>2.5Mbps</td></tr>
<tr><td>3</td><td>OFF</td><td>ON</td><td>ON</td><td>5.0Mbps</td></tr>
<tr><td>4</td><td>ON</td><td>OFF</td><td>OFF</td><td>10Mbps</td></tr>
</table>
Always set the transmission speed within the above range.
The switches are all factory-set to OFF.
Making any other setting than the above will result in an error, flickering the "L ERR." LED.
</td></tr>
<tr><td>6)</td><td>Terminal block</td><td>Used to connect the module power supply, transmission and I/O signals.</td></tr>
<tr><td>7)</td><td>DIN rail hook</td><td>Used to mount the module to the DIN rail.</td></tr>
</table>

4.4 Offset/Gain Setting

When changing the I/O conversion characteristics, follow the procedure below.



*: If the "RUN" LED is not lit, E^2PROM may have failed. For details, refer to Section 6.1.

POINT

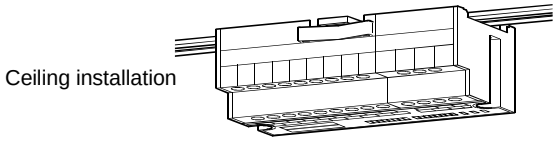
(1) Set the offset and gain values in the actual usage state.
(2) The offset and gain values are stored on E^2PROM in the AJ65SBT-64AD and are not cleared at power-off.
(3) Shorting the TEST terminals to enter the test mode and executing initial settings will start A/D conversion on all channels. To judge the test mode, use the test mode flag as an interlock.
(4) Make offset/gain setting within the range indicated in POINT of Section 3.3.1 and Section 3.3.2. If setting is made outside this range, the maximum resolution/accuracy may not fall within the performance specifications range.
(5) When making offset/gain setting (in the test mode), set all channels to any of "user range settings 1 to 3".
Setting any other range will result in an error and flicker the "RUN" LED at 0.1s intervals.
Refer to Section 3.6.3 for input range setting.
(6) When the grounding indicated in Section 4.8.2 *5 is changed (not performed → perform, or performed to removed), repeat the offset/gain setting from the start.

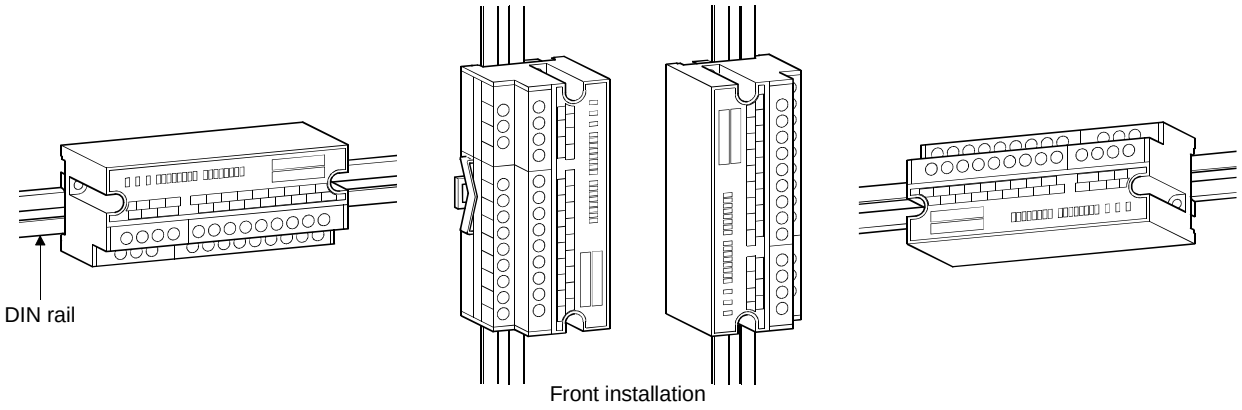
4.5 Station Number Setting

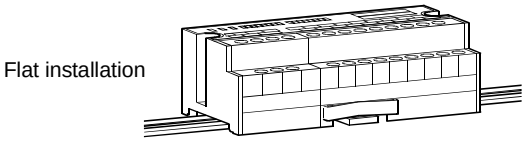
The station number setting of the AJ65SBT-64AD determines the buffer memory addresses of the master module where the remote I/O signals and read/write data are stored.
For details, refer to the user's manual of the master module used.

4.6 Facing Direction of the Module Installation

The AJ65SBT-64AD module may be installed in any of six directions.
(There are no restrictions on the facing directions.)
Also, a DIN rail may be used for installation.







4.7 Data Link Cable Wiring

This section explains the wiring of the CC-Link dedicated cable used for connection of the AJ65SBT-64AD and master module.

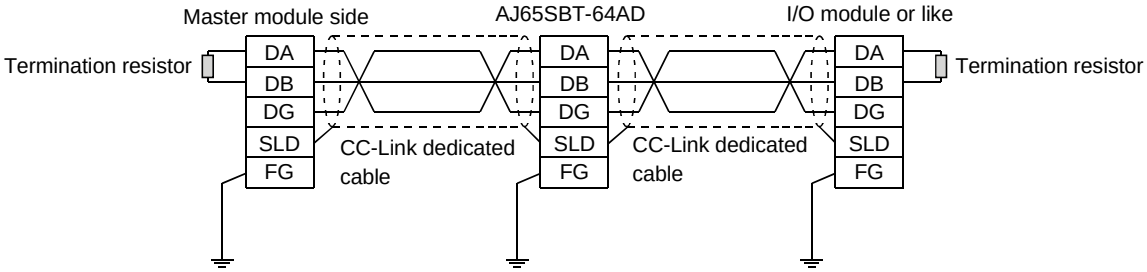
4.7.1 Instructions for handling the CC-Link dedicated cables

Do not handle the CC-Link dedicated cables roughly as described below. Doing so can damage the cables.

- Compact with a sharp object.
- Twist the cable excessively.
- Pull the cable hard. (more than the permitted elasticity.)
- Step on the cable.
- Place an object on the top.
- Scratch the cable's protective layer.

4.7.2 Connection of the CC-Link dedicated cables

Connect the CC-Link dedicated cable between the AJ65SBT-64AD and master module as shown below.



4.8 Wiring

This section provides the instructions for wiring the AJ65SBT-64AD and its wiring with external equipment.

4.8.1 Wiring precautions

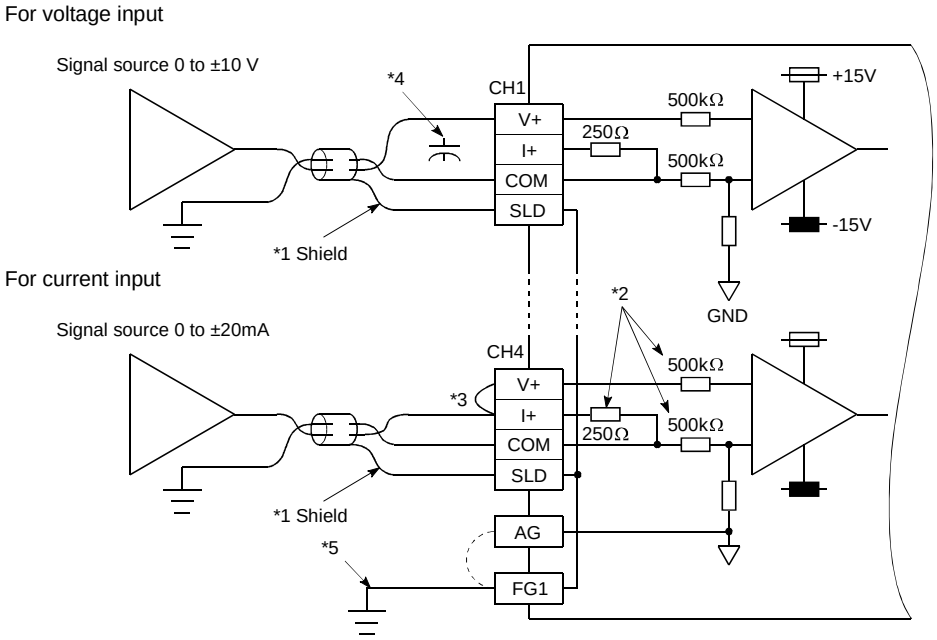
To obtain maximum performance from the functions of AJ65SBT-64AD and improve the system reliability, an external wiring with high durability against noise is required. The precautions when performing external wiring are as follows:

(1) Use separate cables for the AC and AJ65SBT-64AD external input signals, in order not to be affected by the AC side surge or conductivity.

(2) Do not bundle or place with load carrying wires other than the main circuit line, high voltage line or PLC. Noises, surges, or conductivity may affect the system.

(3) Place a one-point grounding on the PLC side for the shielded line or shielded cable. However, depending on the external noise conditions, it may be better have a grounding externally.

4.8.2 Module connection example



*1 Use a two-core twisted shield line for the power cable.
*2 Indicates the AJ65SBT-64AD input resistor.
*3 For the current input, be sure to connect the (V+) and (I+) terminals.
*4 When noise or ripple occurs with the external cable, connect a condenser with about 0.1 to 0.47μF (25V or higher voltage-resistant product) between the terminal V and COM.
*5 Always perform grounding for FG1. When there is a lot of noise, it may be better ground AG as well.
If the grounding wiring (grounding yes/no) is changed after the offset and gain are set, perform the setting of the offset/gain values again.

POINT
A/D conversion values are fluctuated by self-heating within approx. 30 minutes after power is turned ON.

4.9 Maintenance and Inspection

There are no special inspection items for the AJ65SBT-64AD module, but follow the inspections items describes in the PLC CPU User's Manual so that the system can always be used in the best condition.

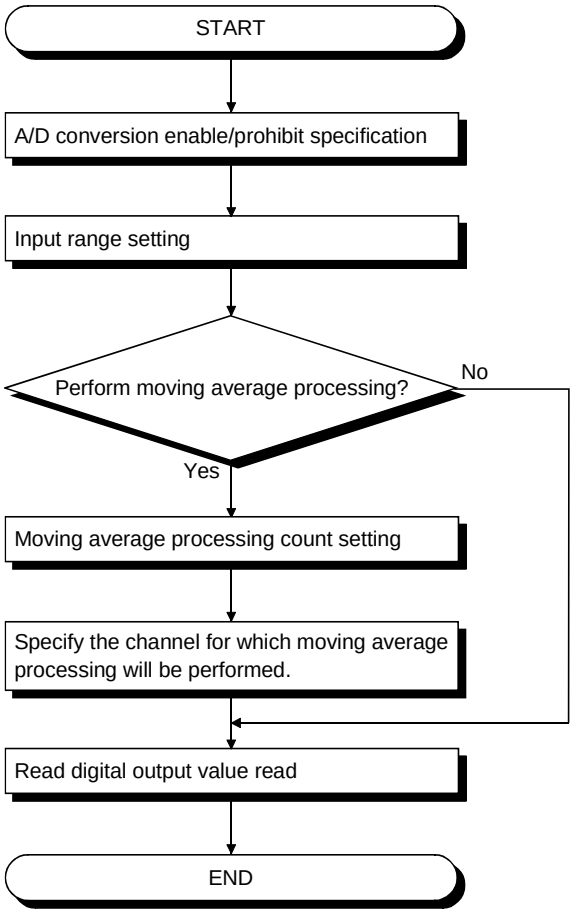
MEMO

5 PROGRAMMING

The programming procedure, basic read/write programs, and program examples for the AJ65SBT-64AD are described.
Refer to Section 3.6 for the remote registers and to the AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode) programming manual (dedicated instructions) for details of the dedicated instructions.

5.1 Programming Procedure

Create a program which executes the AJ65SBT-64AD analog/digital conversion by following the procedure below:



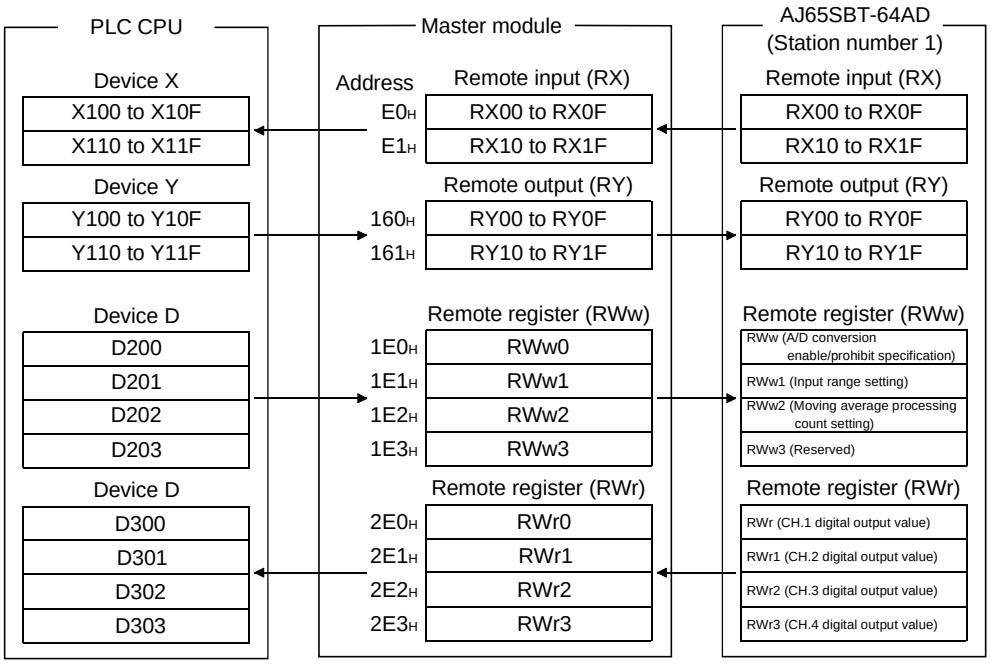
5.2 Program Examples

This section provides the program examples of the AJ65SBT-64AD.

5.2.1 Program examples for use of the ACPU/QCPU (A mode) (FROM/TO instructions)

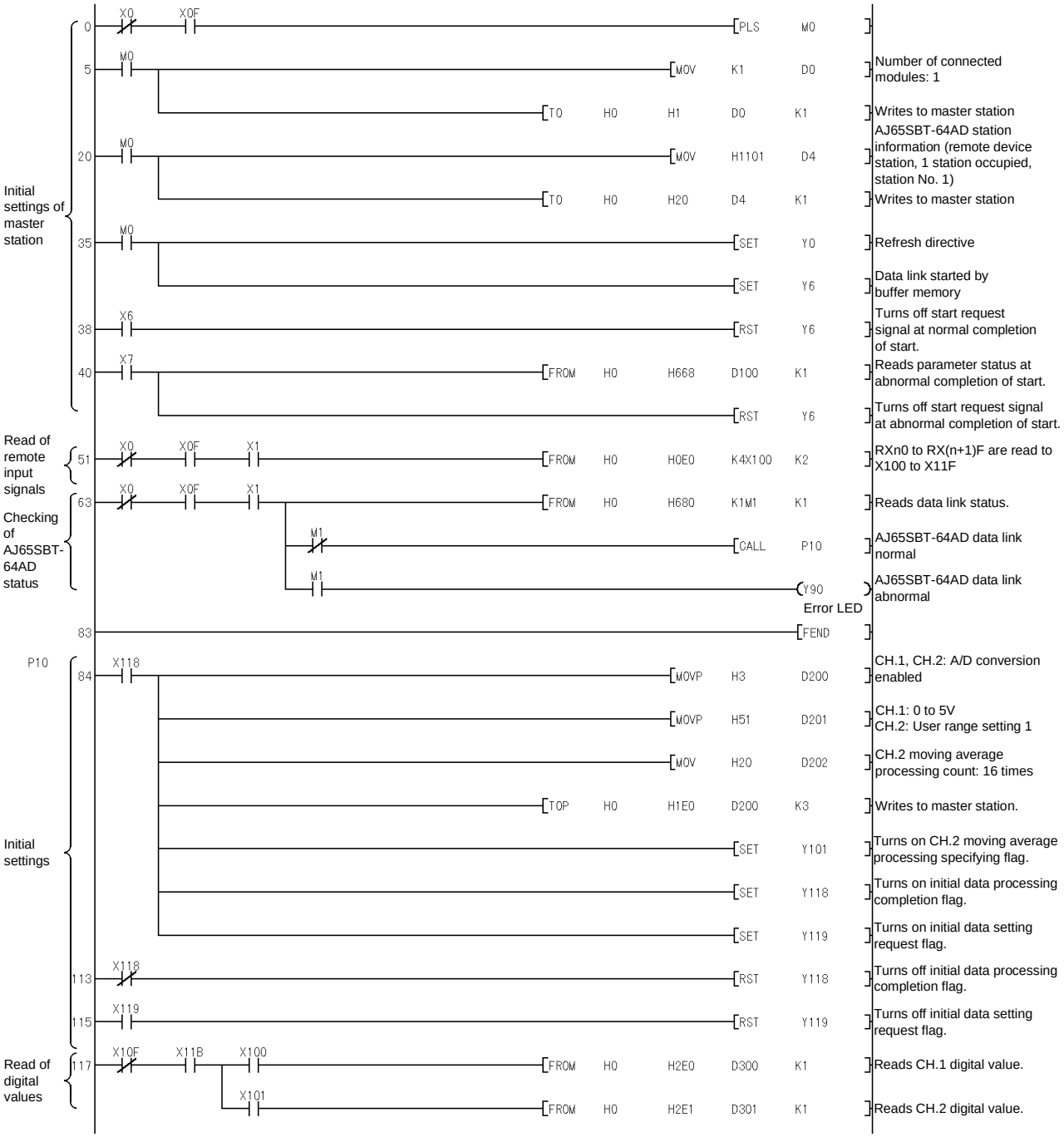
The program examples in this section are created under the following conditions.
A sequence program is used to set the network parameters.

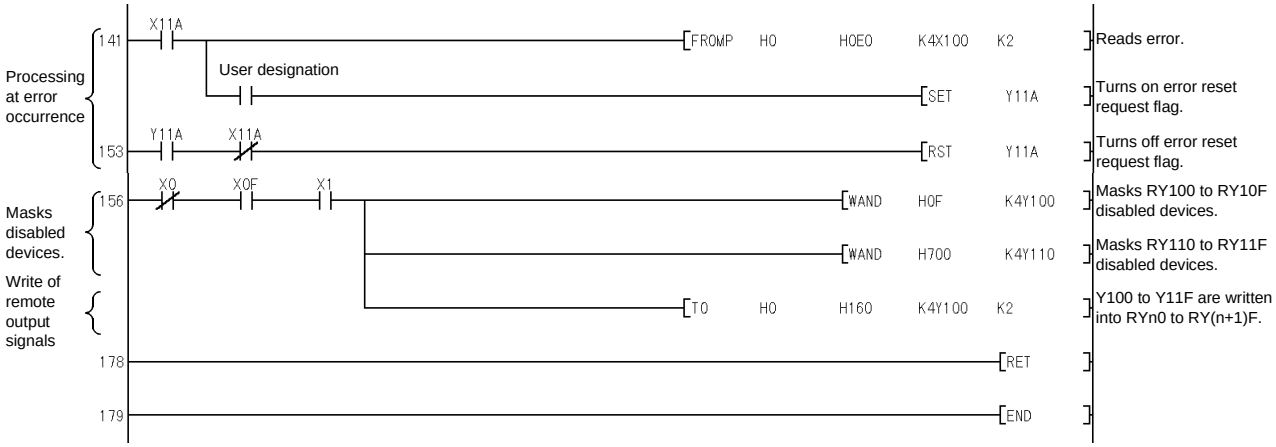
[Relationships between PLC CPU, master module and AJ65SBT-64AD]



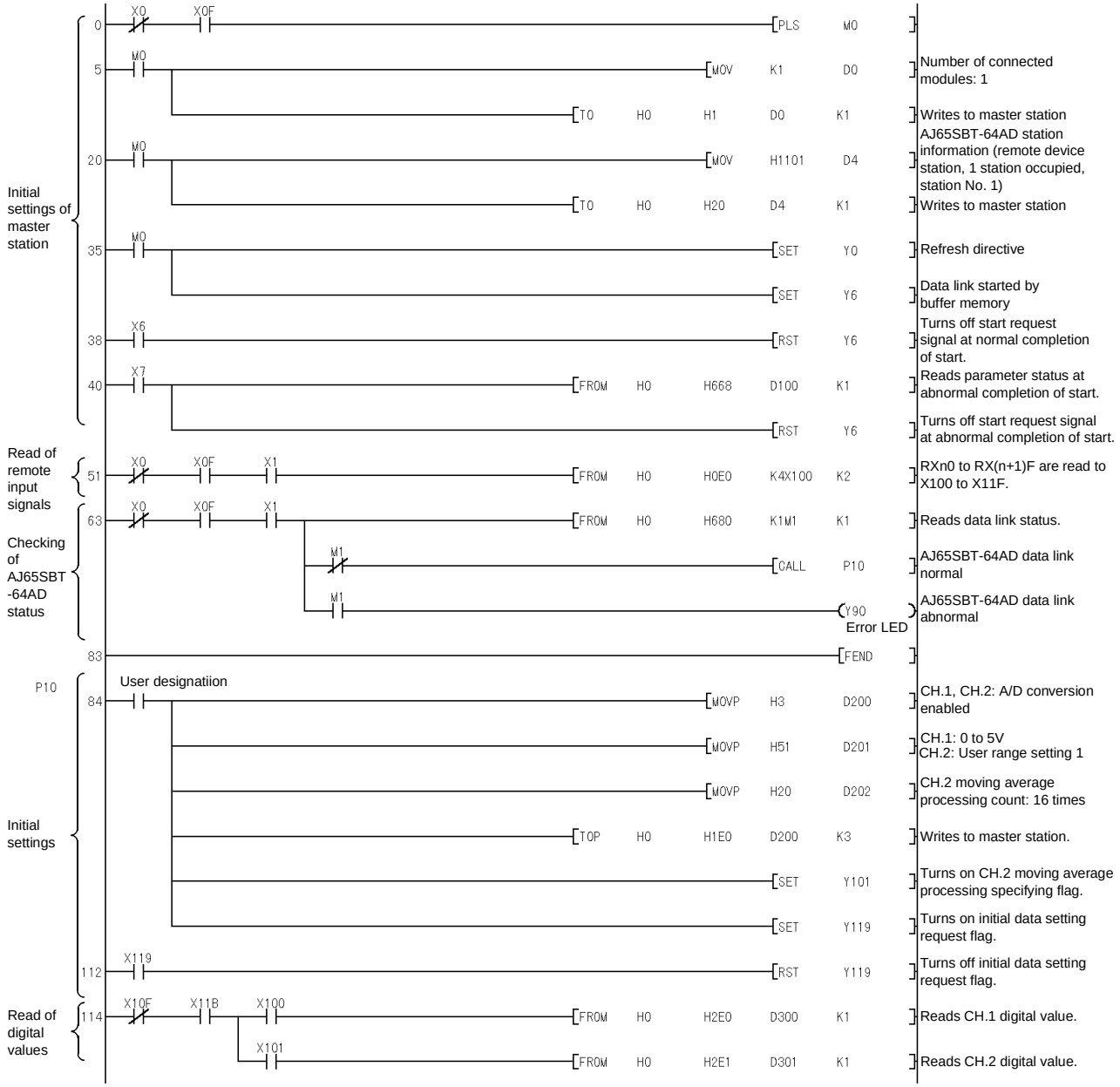
[Initial settings]
A/D conversion enabled channels.....Channels 1, 2
Moving average processing channel.....Channel 2 count setting = 16 times
Input range setting .....Channel 1: 0 to 5V
Channel 2: User range setting 1

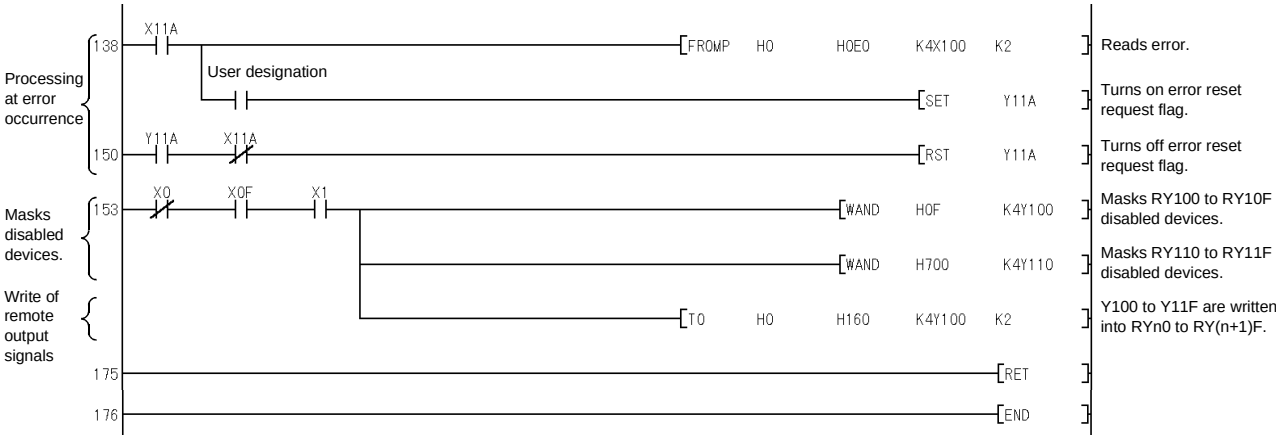
(1) Program example for power-on




Processing at error occurrence
Masks disabled devices.
Write of remote output signals
141
X11A
FROMP H0 H0E0 K4X100 K2
Reads error.
User designation
SET Y11A
Turns on error reset request flag.
153
Y11A X11A
RST Y11A
Turns off error reset request flag.
156
X0 X0F X1
WAND H0F K4Y100
Masks RY100 to RY10F disabled devices.
WAND H700 K4Y110
Masks RY110 to RY11F disabled devices.
TO H0 H160 K4Y100 K2
Y100 to Y11F are written into RYn0 to RY(n+1)F.
178
RET
179
END

(2) Program example for initial data changing

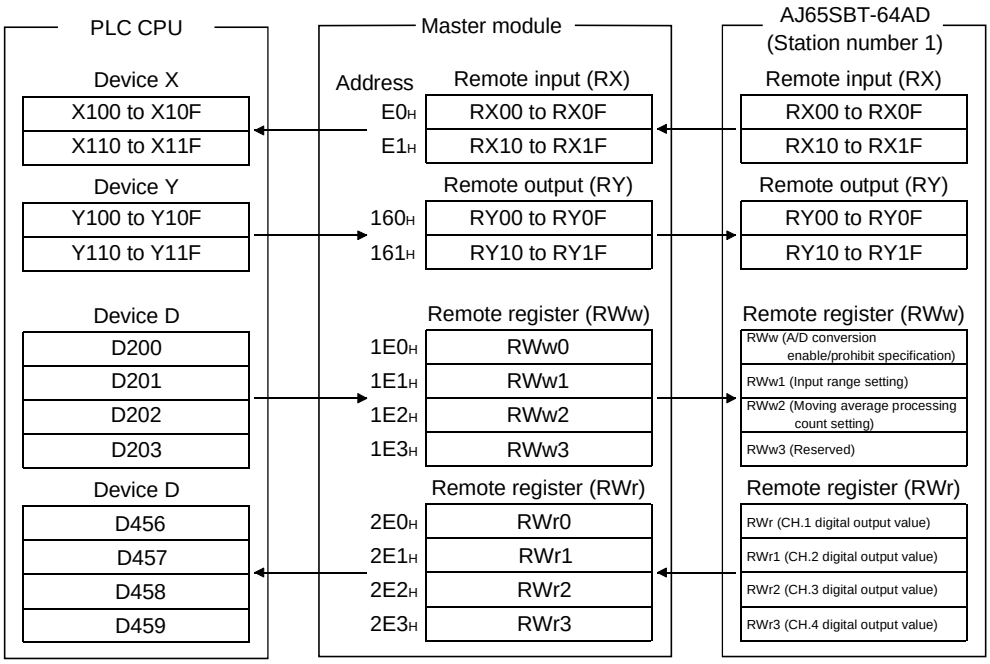



Processing at error occurrence
Masks disabled devices.
Write of remote output signals
138
X11A
FROMP H0 H0E0 K4X100 K2
Reads error.
User designation
SET Y11A
Turns on error reset request flag.
150
Y11A X11A
RST Y11A
Turns off error reset request flag.
153
X0 X0F X1
WAND H0F K4Y100
Masks RY100 to RY10F disabled devices.
WAND H700 K4Y110
Masks RY110 to RY11F disabled devices.
TO H0 H160 K4Y100 K2
Y100 to Y11F are written into RYn0 to RY(n+1)F.
175
RET
176
END

5.2.2 Program examples for use of the ACPU/QCPU (A mode) (dedicated instructions)

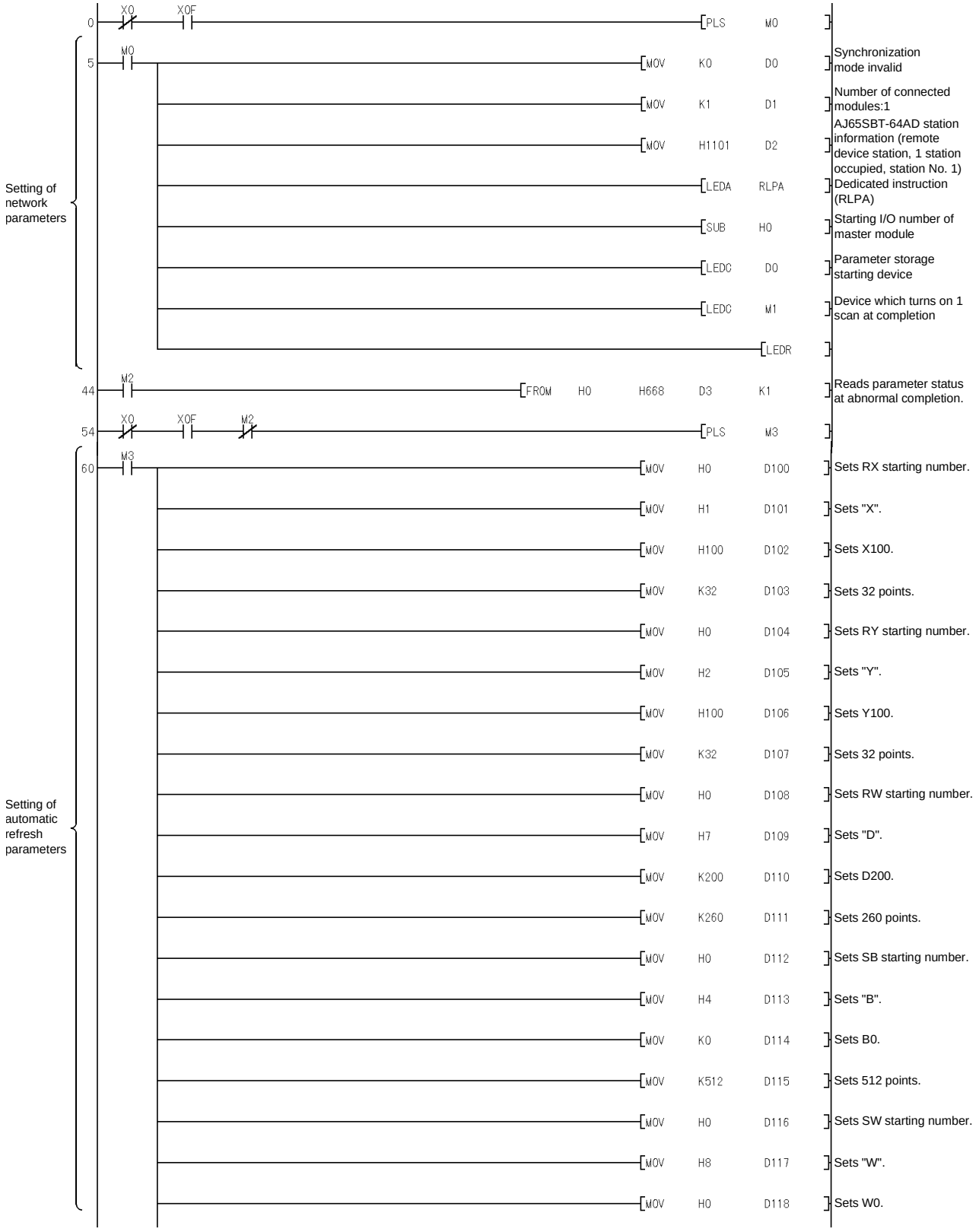
The program examples in this section are created under the following conditions.
A sequence program is used to set the network and automatic refresh parameters.

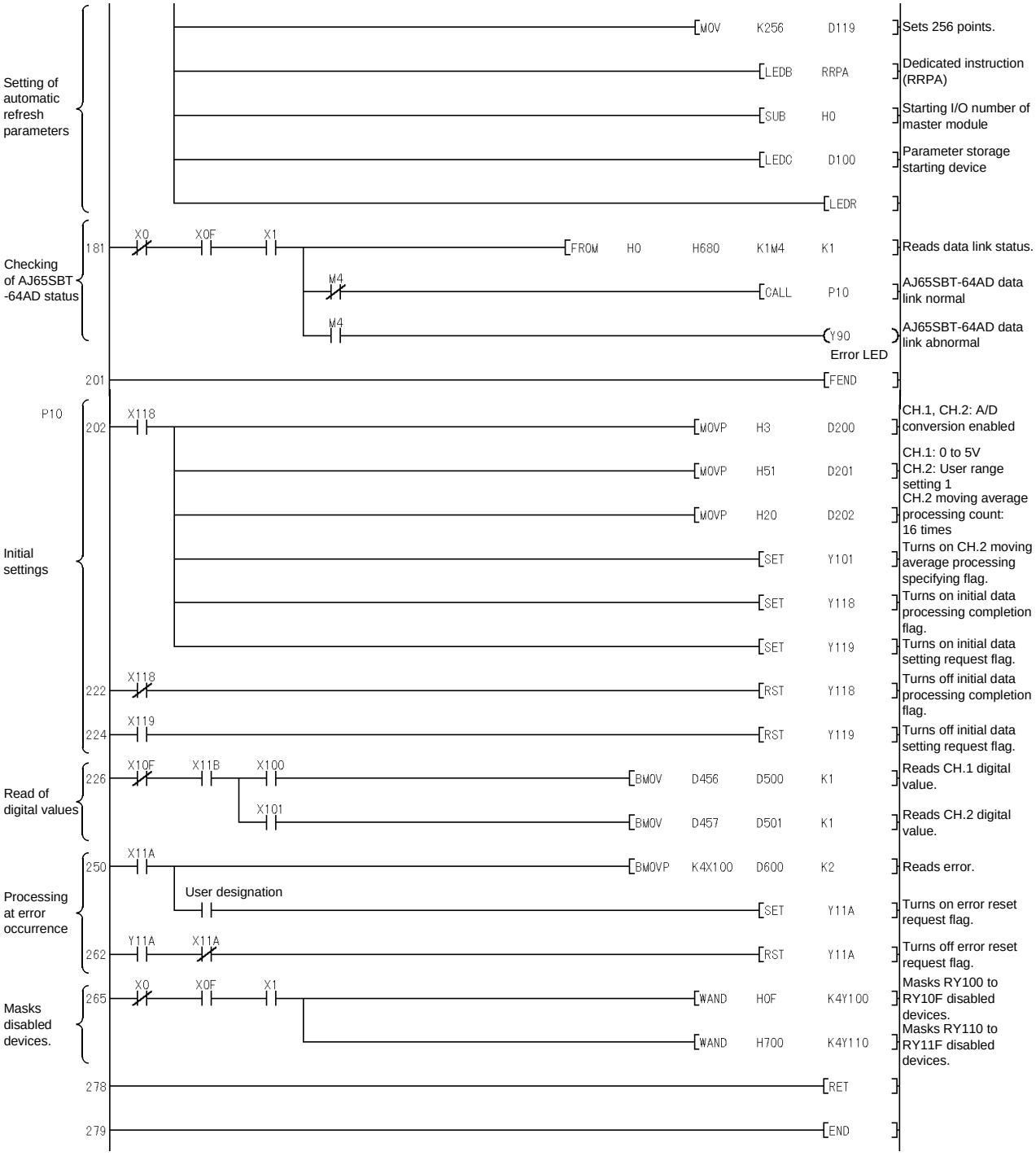
[Relationships between PLC CPU, master module and AJ65SBT-64AD]



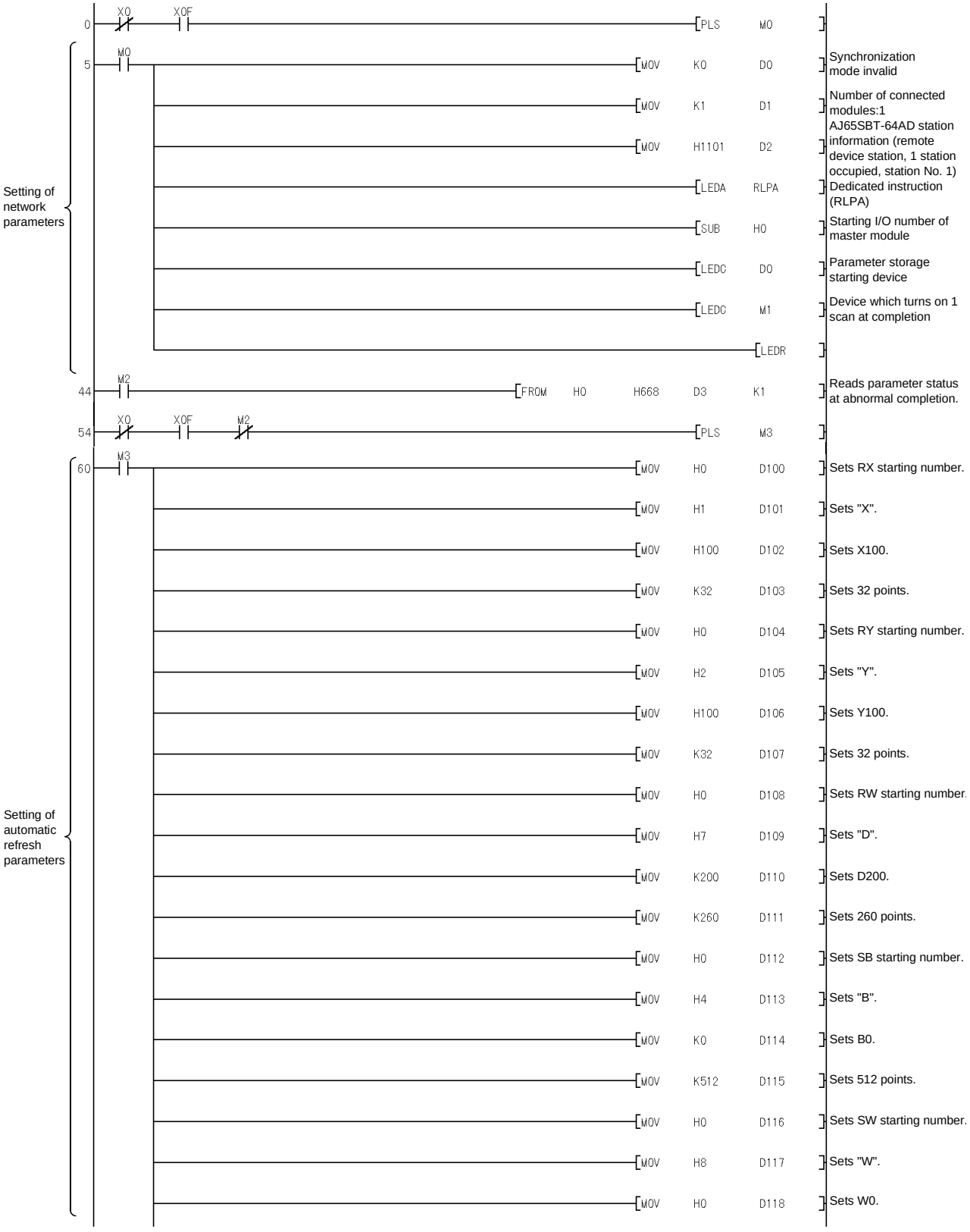
[Initial settings]
A/D conversion enabled channels.....Channels 1, 2
Moving average processing channel.....Channel 2 count setting = 16 times
Input range setting .....Channel 1: 0 to 5V
Channel 2: User range setting 1

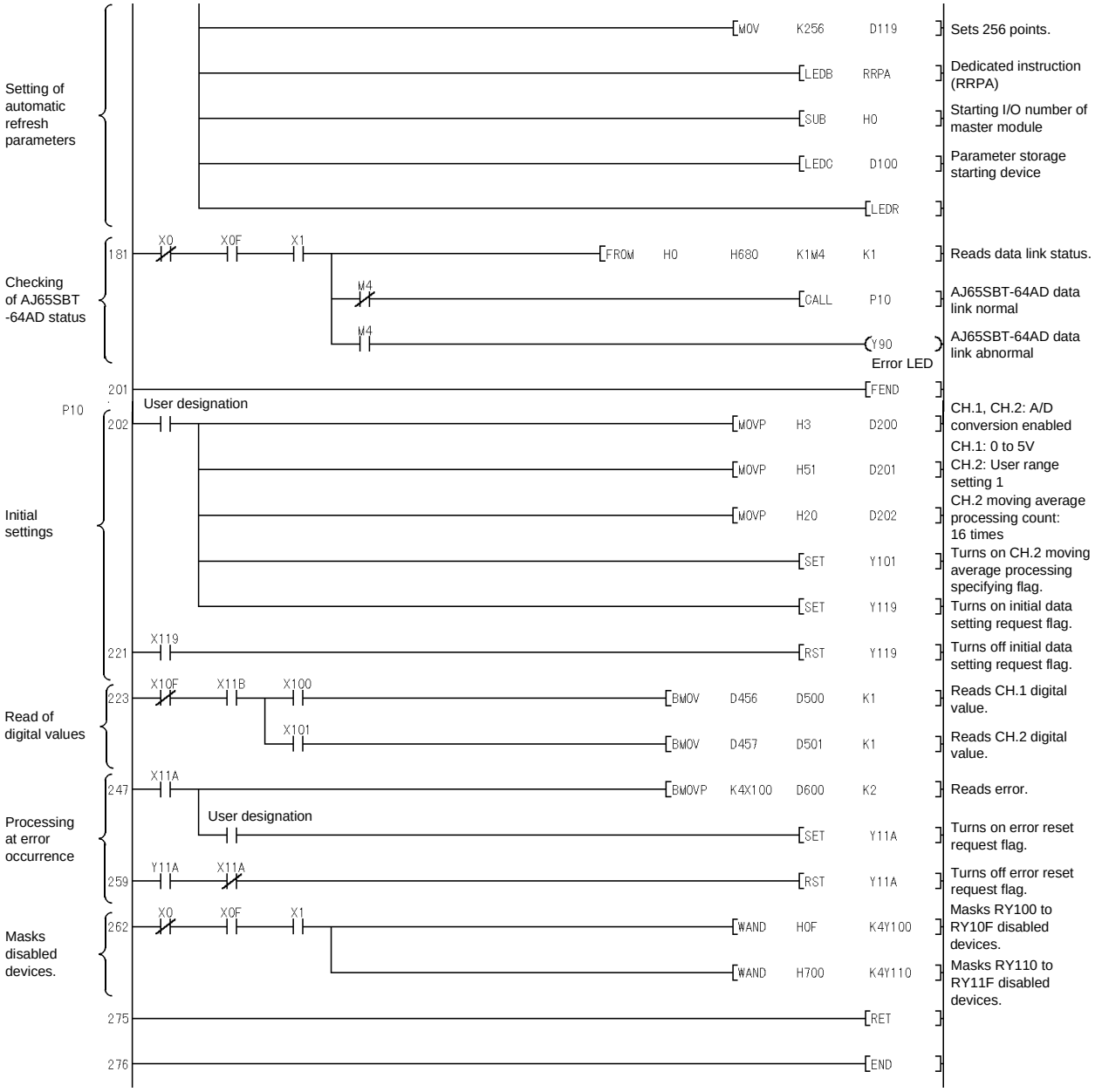
(1) Program example for power-on




Setting of automatic refresh parameters
MOV K256 D119
Sets 256 points.
LEDB RRPA
Dedicated instruction (RRPA)
SUB H0
Starting I/O number of master module
LEDC D100
Parameter storage starting device
LEDR
Checking of AJ65SBT -64AD status
181
X0 X0F X1
FROM H0 H680 K1M4 K1
Reads data link status.
M4
CALL P10
AJ65SBT-64AD data link normal
M4
Y90
AJ65SBT-64AD data link abnormal
Error LED
201
FEND
P10
Initial settings
202
X118
MOVP H3 D200
CH.1, CH.2: A/D conversion enabled
MOVP H51 D201
CH.1: 0 to 5V
CH.2: User range setting 1
MOVP H20 D202
CH.2 moving average processing count: 16 times
SET Y101
Turns on CH.2 moving average processing specifying flag.
SET Y118
Turns on initial data processing completion flag.
SET Y119
Turns on initial data setting request flag.
222
X118
RST Y118
Turns off initial data processing completion flag.
224
X119
RST Y119
Turns off initial data setting request flag.
Read of digital values
226
X10F X11B X100
BMOV D456 D500 K1
Reads CH.1 digital value.
X101
BMOV D457 D501 K1
Reads CH.2 digital value.
Processing at error occurrence
250
X11A
BMOVP K4X100 D600 K2
Reads error.
User designation
SET Y11A
Turns on error reset request flag.
262
Y11A X11A
RST Y11A
Turns off error reset request flag.
Masks disabled devices.
265
X0 X0F X1
WAND H0F K4Y100
Masks RY100 to RY10F disabled devices.
WAND H700 K4Y110
Masks RY110 to RY11F disabled devices.
278
RET
279
END

(2) Program example for initial data changing

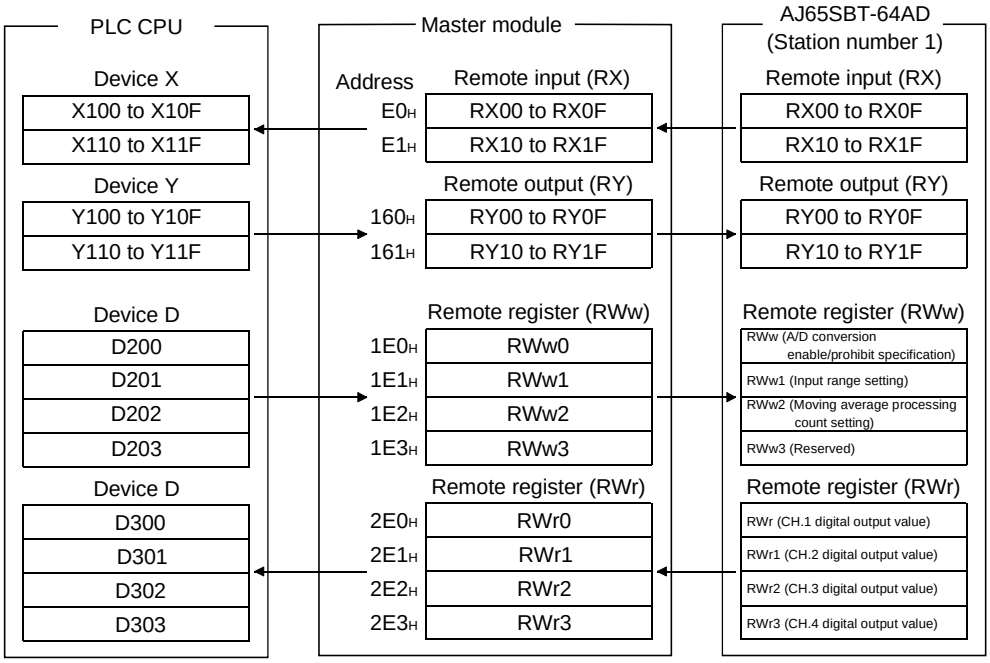



Setting of automatic refresh parameters
MOV K256 D119
Sets 256 points.
LEDB RRPA
Dedicated instruction (RRPA)
SUB H0
Starting I/O number of master module
LEDC D100
Parameter storage starting device
LEDR
Checking of AJ65SBT -64AD status
181
X0 X0F X1
FROM H0 H680 K1M4 K1
Reads data link status.
M4
CALL P10
AJ65SBT-64AD data link normal
M4
Y90
AJ65SBT-64AD data link abnormal
Error LED
201
FEND
P10
User designation
Initial settings
202
MOVP H3 D200
CH.1, CH.2: A/D conversion enabled
CH.1: 0 to 5V
MOVP H51 D201
CH.2: User range setting 1
MOVP H20 D202
CH.2 moving average processing count: 16 times
SET Y101
Turns on CH.2 moving average processing specifying flag.
SET Y119
Turns on initial data setting request flag.
221
X119
RST Y119
Turns off initial data setting request flag.
Read of digital values
223
X10F X11B X100
BMOV D456 D500 K1
Reads CH.1 digital value.
X101
BMOV D457 D501 K1
Reads CH.2 digital value.
Processing at error occurrence
247
X11A
BMOVP K4X100 D600 K2
Reads error.
User designation
SET Y11A
Turns on error reset request flag.
259
Y11A X11A
RST Y11A
Turns off error reset request flag.
Masks disabled devices.
262
X0 X0F X1
WAND H0F K4Y100
Masks RY100 to RY10F disabled devices.
WAND H700 K4Y110
Masks RY110 to RY11F disabled devices.
275
RET
276
END

5.2.3 Program examples for use of the QnACPU

The program examples in this section are created under the following conditions.
GPPW is used to set the network and automatic refresh parameters.

[Relationships between PLC CPU, master module and AJ65SBT-64AD]



[Initial settings]
A/D conversion enabled channels.....Channels 1, 2
Moving average processing channel.....Channel 2 count setting = 16 times
Input range setting .....Channel 1: 0 to 5V
Channel 2: User range setting 1

[Network parameter setting]

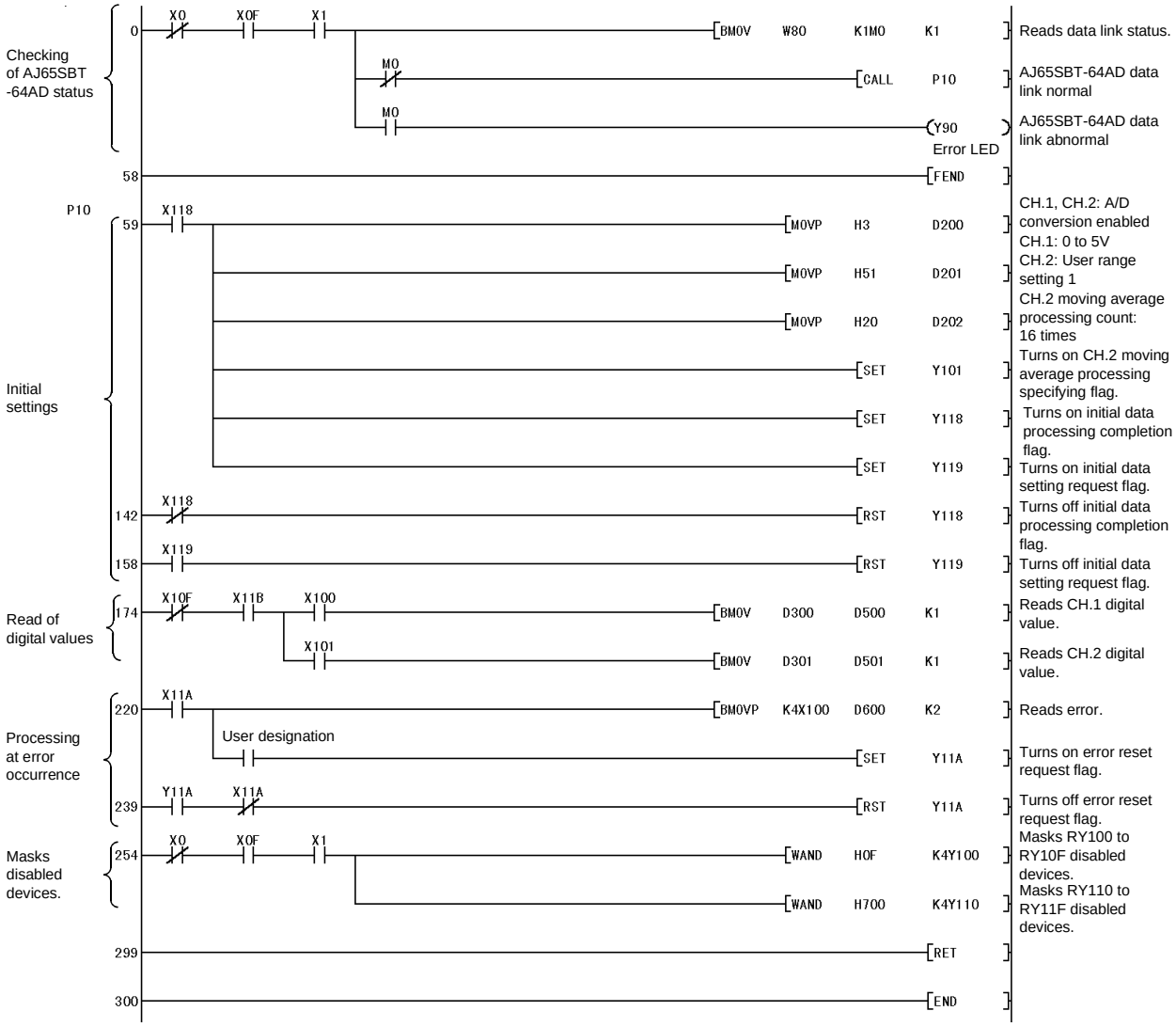
	1
Start I/O No.	0000
Type	Master station
All connect count	1
Remote input(RX)	
Remote output(RY)	
Remote register(RWr)	
Remote register(RWw)	
Special relay(SB)	
Special register(SW)	
Retry count	3
Automatic reconnection station count	1
Wait master station No.	0
PLC down select	Stop
Scan mode setting	Asynchronously
Delay information setting	0
Station information setting	Station information

		Exclusive station	Reserve/invalid	Intelligent buffer select(word)		
StationNo.	Station type	count	station select	Send	Receive	Automatic
1/1	Remote device station	Exclusive station 1	No setting			

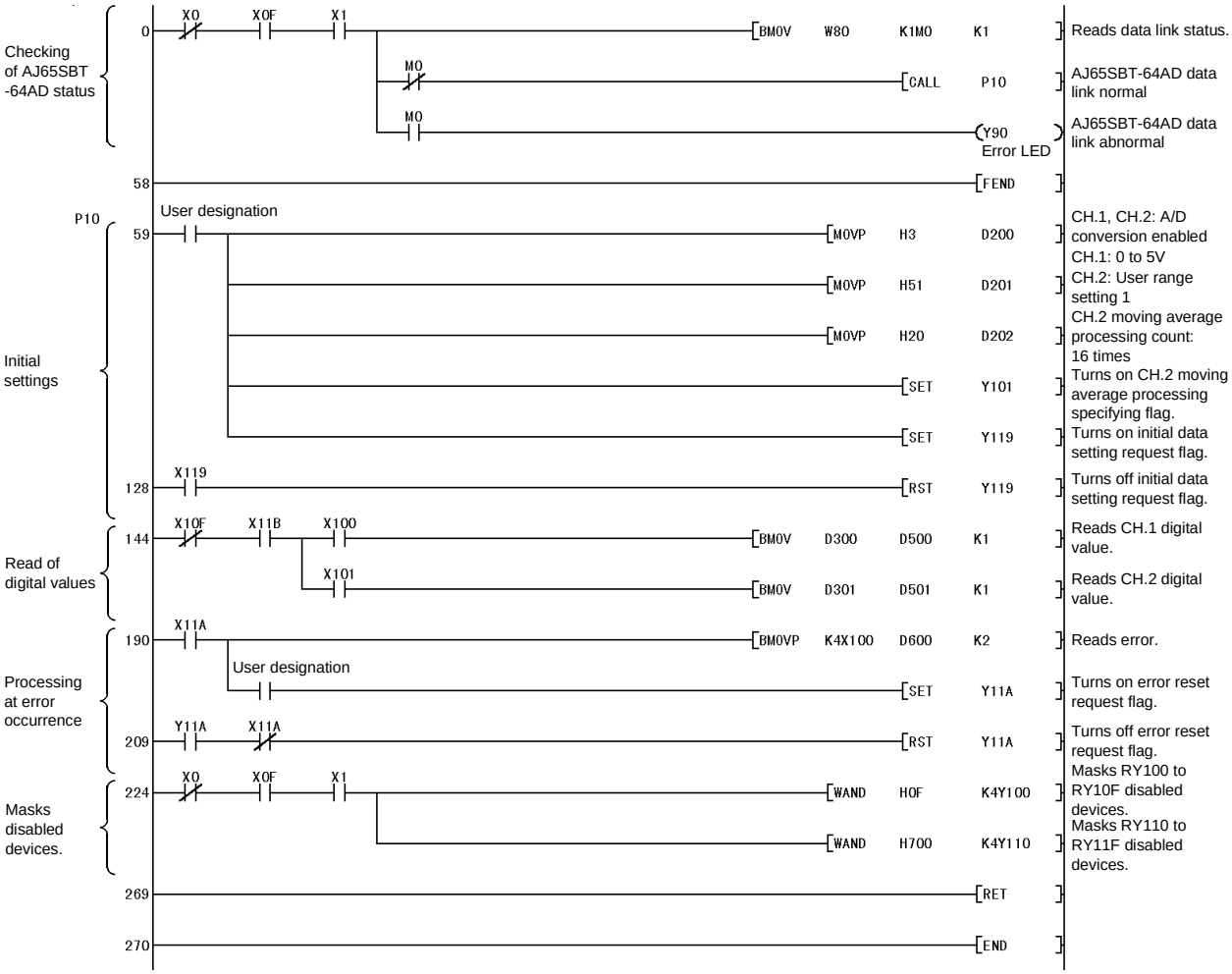
[Automatic refresh parameter setting]

	1
Start I/O No.	0000
Type	Master station
All connect count	1
Remote input(RX)	X100
Remote output(RY)	Y100
Remote register(RWr)	D300
Remote register(RWw)	D200
Special relay(SB)	B0
Special register(SW)	W0
Retry count	3
Automatic reconnection station count	1
Wait master station No.	0
PLC down select	Stop
Scan mode setting	Asynchronously
Delay information setting	0
Station information setting	Station information

(1) Program example for power-on



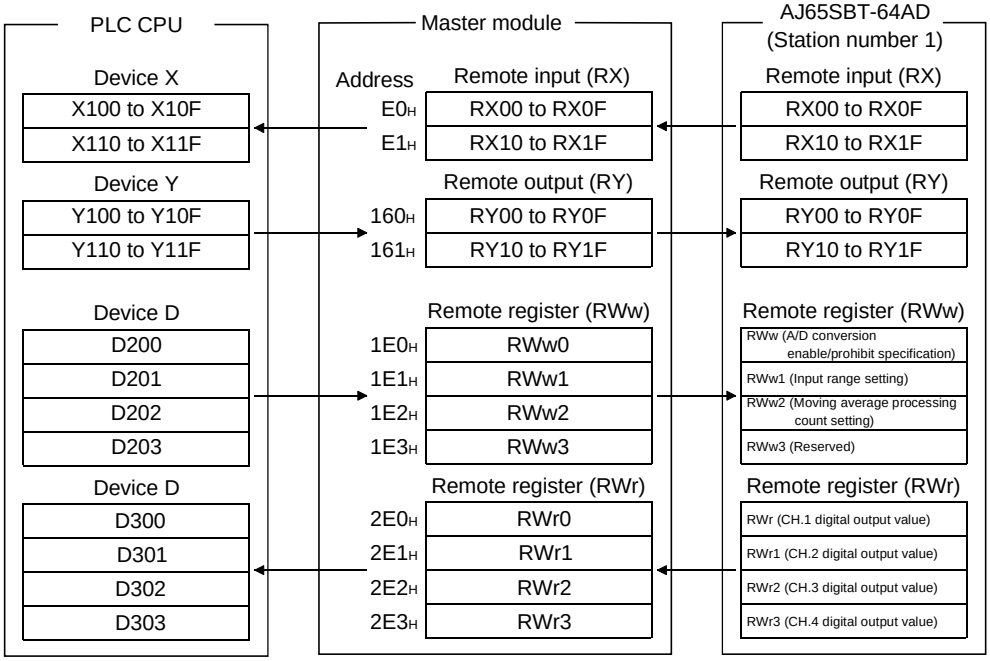
(2) Program example for initial data changing



5.2.4 Program examples for use of the QCPU (Q mode)

The program examples in this section are created under the following conditions.
GPPW is used to set the network and automatic refresh parameters.

[Relationships between PLC CPU, master module and AJ65SBT-64AD]



[Initial settings]
A/D conversion enabled channels.....Channels 1, 2
Moving average processing channel.....Channel 2 count setting = 16 times
Input range setting .....Channel 1: 0 to 5V
Channel 2: User range setting 1

[Network parameter setting]

	1
Start I/O No.	0000
Operational setting	Operational settings
Type	Master station
Master station data link type	PLC parameter auto start
Mode	Online (Remote net mode)
All connect count	1
Remote input(RX)	
Remote output(RY)	
Remote register(RWr)	
Remote register(RWw)	
Special relay(SB)	
Special register(SW)	
Retry count	3
Automatic reconnection station count	1
Stand by master station No.	
PLC down select	Stop
Scan mode setting	Asynchronous
Delay infomation setting	0
Station information setting	Station information
Remote device station initial setting	Initial settings
Interrupt setting	Interrupt settings

Station No.	Station type	Exclusive station count	Reserve/invalid station select	Intelligent buffer select(word)		
				Send	Receive	Automatic
1/ 1	Remote device station	Exclusive station 1	No setting			

[Automatic refresh parameter setting]

	1
Start I/O No.	0000
Operational setting	Operational settings
Type	Master station
Master station data link type	PLC parameter auto start
Mode	Online (Remote net mode)
All connect count	1
Remote input(RX)	X100
Remote output(RY)	Y100
Remote register(RWr)	D300
Remote register(RWw)	D200
Special relay(SB)	SB0
Special register(SW)	SW0
Retry count	3
Automatic reconnection station count	1
Stand by master station No.	
PLC down select	Stop
Scan mode setting	Asynchronous
Delay infomation setting	0
Station information setting	Station information
Remote device station initial setting	Initial settings
Interrupt setting	Interrupt settings

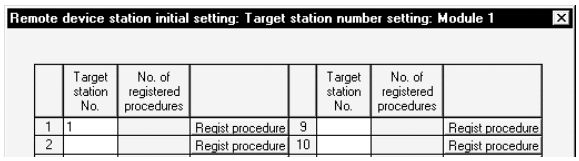
(1) Program for power-on

At power-on, the initial setting of the AJ65SBT-64AD can be made easily using the remote device station initialization procedure registration function.

(a) Setting the target station number

Set the station number to which initial setting will be made.

Set the target station number to "1".



(b) Setting the procedure registration

When the initial data processing request flag (RX(n+1)8) turns on and the remote device station initialization procedure registration (SB0D) is set, the following data are registered to the AJ65SBT-64AD.

Procedure Execution Condition	Execution	Number
Initial data processing request flag (RX(n+1)8) turns on	Channels 1, 2 are set to A/D conversion enable.	1)
	Input range setting of channel 1 is set to 0 to 5V. Input range setting of channel 2 is set to user range setting 1.	2)
	Moving average processing count of channel 2 is set to 16 times.	3)
	Channel 2 is set to moving average processing.	4)
	Initial data processing completion flag (RY(n+1)8) is turned on.	5)
	Initial data setting request flag (RY(n+1)9) is turned on.	6)
Initial data processing request flag (RX(n+1)8) turns off	Initial data processing completion flag (RY(n+1)8) is turned off.	7)
Initial data setting completion flag (RX(n+1)9) turns on	Initial data setting request flag (RY(n+1)9) is turned off.	8)

(c) Setting results

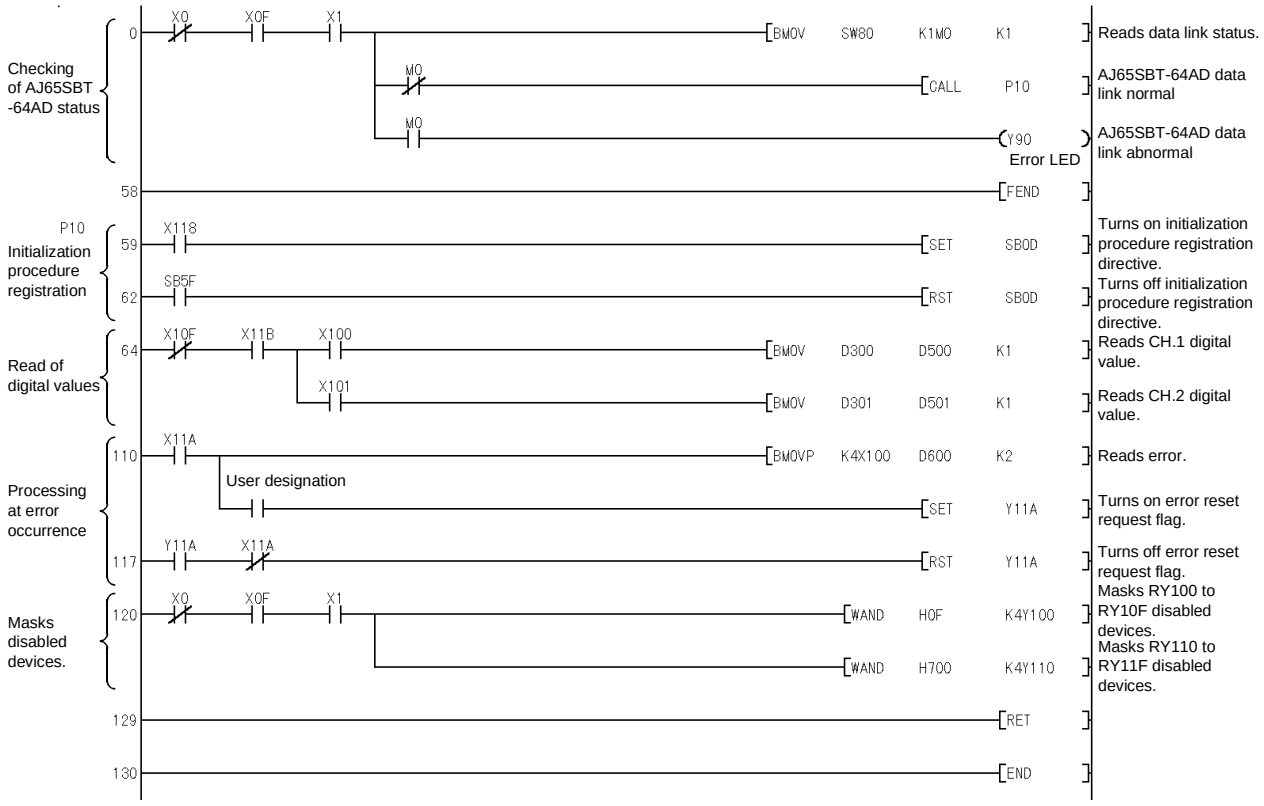
The setting results of 1) to 8) are shown below.

Remote device station initial setting: Procedure registration module 1: Target station 1

Input format: HEX.

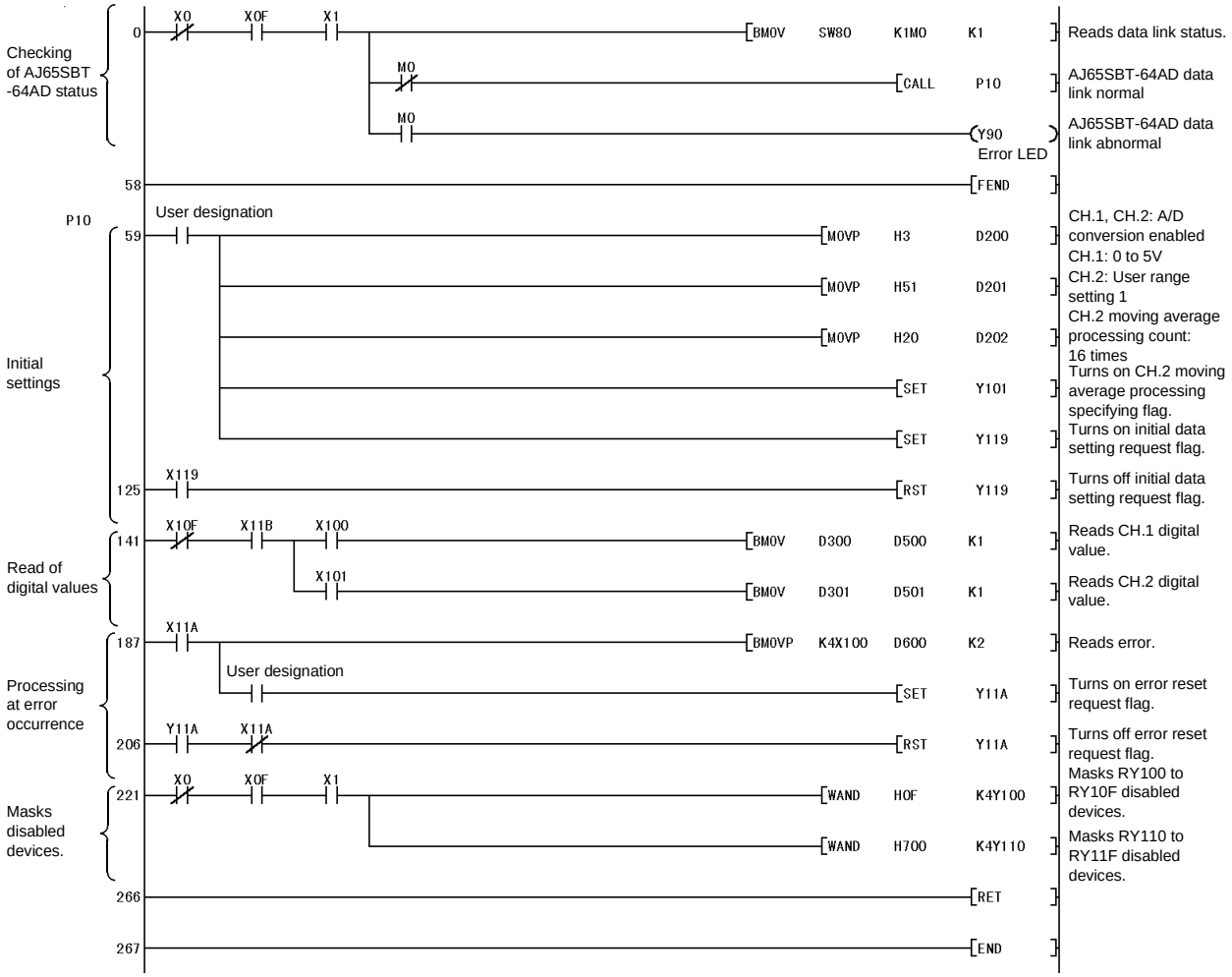
Execute Flag	Operational condition	Executional condition: Condition Device	Executional condition: Device Number	Executional condition: Execute Condition	Details of execution: Write Device	Details of execution: Device Number	Details of execution: Write Data
Execute	Set new	RX	18	ON	RWw	00	0003
Execute	Same as prev.set	RX	18	ON	RWw	01	0051
Execute	Same as prev.set	RX	18	ON	RWw	02	0020
Execute	Same as prev.set	RX	18	ON	RY	01	ON
Execute	Same as prev.set	RX	18	ON	RY	18	ON
Execute	Same as prev.set	RX	18	ON	RY	19	ON
Execute	Set new	RX	18	OFF	RY	18	OFF
Execute	Set new	RX	19	ON	RY	19	OFF

(d) Program example



(2) Program for initial data changing

When any initial data (conversion processing system, input range, A/D conversion enable/disable channel) is changed, the remote device station initialization procedure registration function is unusable.
Using a sequence program, change the initial data.
The program example for initial data changing is shown below.



6 TROUBLESHOOTING

The details of the errors which may occur when using the AJ65SBT-64AD and troubleshooting are described.

6.1 Using the Remote Input Signals to Check Errors

In the AJ65SBT-64AD, occurrence of a write error turns on any of the following remote input signals.

Device No.	Signal Name	Description
RXn4	CH.1 range error flag	Turns on when the value set for input range setting is outside the setting range. Turns on if all channels are not set to any of "user range settings 1 to 3" at offset/gain setting (in the test mode).
RXn5	CH.2 range error flag	
RXn6	CH.3 range error flag	
RXn7	CH.4 range error flag	
RXnC	E^2PROM write error flag	Turns on if value write failed due to excess of the E^2PROM write count over its limit at the time of offset/gain setting. If this flag has turned on, this module itself has failed (hardware fault) and therefore this flag cannot be reset (turned off) by the error reset request flag.
RX(n+1)A	Error status flag	Turns on when CH. □ range error flag (RXn4 to RXn7) or E^2PROM write error flag (RXnC) has turned on. This flag can be reset (turned off) by turning on the error reset request flag. However, for the E^2PROM write error which cannot be reset, this flag cannot be reset, either.

(1) For the input range setting error (RXn4 to RXn7), the "RUN" LED flickers at intervals of 0.1s and A/D conversion is not performed on all channels.

(2) For the E^2PROM write error (RXnC), power on the AJ65SBT-64AD again.
If the E^2PROM write error (RXnC) turns on after power is switched on again, it indicates a hardware fault. Contact your nearest Mitsubishi representative.

6.2 Using the LED Indications to Check Errors

This section explains how to check errors using the LED indications of the AJ65SBT-64AD.
Refer to the PLC CPU and master module user's manual for issues regarding the PLC CPU and master module.

(1) When the AJ65SBT-64AD "PW" LED is off

Check item	Corrective action
Is 24VDC power on?	Check the external power supply.
Is the voltage of the 24VDC power supply within the specified value?	Set the voltage value to within the range 20.4 to 26.4V.

(2) When the AJ65SBT-64AD "RUN" LED is flashing

Check item	Corrective action
Is the LED flickering at 0.1s intervals in the normal mode?	1. Using the remote input signals (RXn4 to RXn7), check the channel at which the input range setting error has occurred. 2. Make correction to the sequence program or GPPW setting.
Is the LED flickering at 0.1s intervals in the test mode?	Set all channels to any of "user range settings 1 to 3" in input range setting.
Is the LED flickering at 0.5s intervals in the test mode?	Change the offset/gain adjustment to within the available setting range.

(3) When the AJ65SBT-64AD "RUN" LED is off

Check item	Corrective action
Has the watchdog timer error occurred?	Using the link special registers (SW0084 to SW0087) of the master module, check the watchdog timer error and power on the AJ65SBT-64AD again. If the "RUN" LED is not lit after power is switched on again, the possible cause is a hardware fault. Contact your nearest Mitsubishi representative.
Has the TEST terminals (across 8-9) been shorted to enter the test mode?	After making offset/gain adjustment, open the TEST terminals (across 8-9).

(4) When the AJ65SBT-64AD "L RUN" LED is off
Communications are broken.
For details, refer to troubleshooting in the user's manual of the master module used.

(5) When the AJ65SBT-64AD "L ERR." LED flickers at fixed intervals

Check item	Corrective action
Has the station number or transmission speed setting switch position been changed during normal operation?	After correcting the setting switch setting, switch power on again.
Is the station number or transmission speed setting switch faulty?	If the "L ERR." LED has begun flickering though switch setting change was not made during operation, the possible cause is a hardware fault. Contact your nearest Mitsubishi representative.

(6) When the AJ65SBT-64AD "L ERR." LED flickers at unfixed intervals

Check item	Corrective action
Have you forgotten fitting the terminal resistor?	Check whether the terminal resistor is fitted. If it is not connected, connect it and switch power on again.
Is the module or CC-Link dedicated cable affected by noise?	Earth both ends of the shield wire of the CC-Link dedicated cable to the protective earth conductor via SLD and FG of the corresponding module. Earth the FG terminal of the module without fail. When carrying out wiring in piping, earth the pipe without fail.

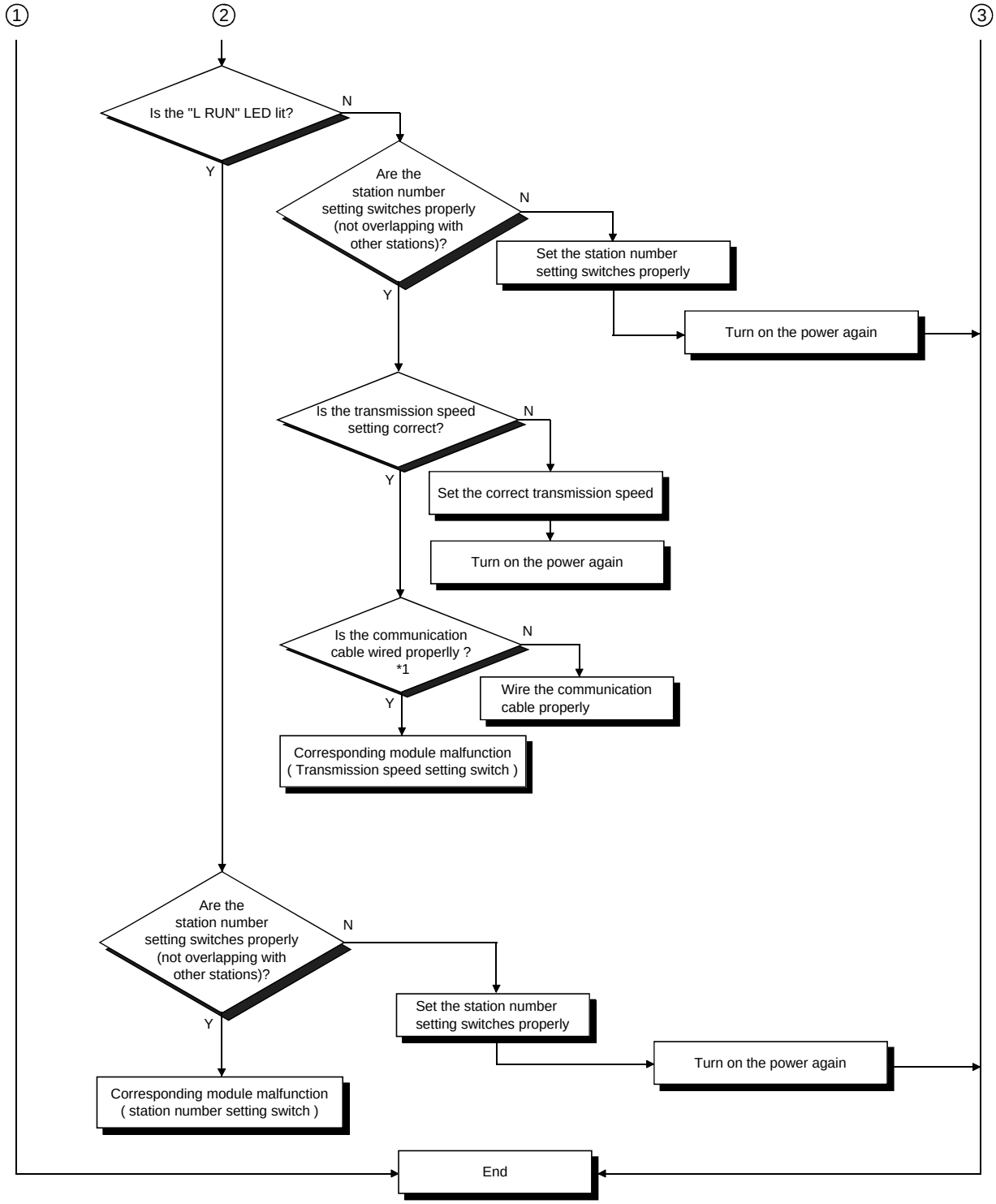
(7) When the AJ65SBT-64AD "L ERR." LED is on

Check item	Corrective action
Are the station number and transmission speed correct?	Set the correct station number and transmission speed.

6.3 When the digital output value cannot be read

Check item	Corrective action
Is the "PW" LED off?	Take action as described in Section 6.2 (1).
Is the "RUN" LED flashing or off?	Take action as described in Section 6.2 (2), (3).
Is the "L RUN" LED off?	Take action as described in Section 6.2 (4).
Is the "L ERR." LED on?	Take action as described in Section 6.2 (7). Check the error details according to the master module user's manual.
Is the PLC CPU "RUN" LED flashing or off?	Check the error details according to the PLC CPU user's manual.
Is the master module "RUN" LED off?	Check the error details according to the master module user's manual.
Is the master module [RD] [SD] LED on?	Check the error details according to the master module user's manual.
Is the analog input signal line disconnected, cut off, or any errors?	Check the error area by checking the signal line visually or by conductive check.
Remove the AJ65SBT-64AD analog input cable. Apply the test voltage (stable power supply or battery) to this module's terminal, and measure the digital output value.	If he AJ65SBT-64AD module digital output value is normal, the effects are being received by noise from an external wiring. So check the wiring and grounding method. Lift the AJ65SBT-64AD from the system, and remove the grounding circuit. (install to the DIN rail.)

6.4 Troubleshooting for the Case where the "ERR." LED of the Master Station Flickers



*1 Check for a short, reversed connection, wire breakage, terminal resistor, FG connection, overall distance and station-to-station distance.

APPENDIX

Appendix1 Comparison between This Product and Conventional Product

(1) Comparison in performance between this product and conventional product
The following table gives performance comparison between the AJ65SBT-64AD and conventional product (AJ65BT-64AD).

Performance Comparison between AJ65SBT-64AD and Conventional Product

<table>
<tr><td colspan="2" rowspan="2">Item</td><td colspan="2">Specifications</td></tr>
<tr><td>AJ65SBT-64AD</td><td>AJ65BT-64AD</td></tr>
<tr><td rowspan="2">Analog input</td><td>Voltage</td><td>-10 to +10VDC (input resistance: 1MΩ)</td><td>-10 to +10VDC (input resistance: 1MΩ)</td></tr>
<tr><td>Current</td><td>0 to 20mADC (input resistance: 250Ω)</td><td>-20 to +20mADC (input resistance: 250Ω)</td></tr>
<tr><td colspan="2">Digital output</td><td>-4096 to +4095</td><td>-4000 to +4000</td></tr>
<tr><td colspan="2">I/O characteristics Maximum resolution</td><td>
<table>
<tr><th></th><th>Input Range</th><th>Digital Output</th><th>Max. Resolution</th></tr>
<tr><td rowspan="6">Voltage</td><td>-10 to +10V</td><td rowspan="2">-4000 to +4000</td><td rowspan="2">2.5mV</td></tr>
<tr><td>User range setting 1 (-10 to +10V)</td></tr>
<tr><td>0 to 5V</td><td rowspan="3">0 to 4000</td><td>1.25mV</td></tr>
<tr><td>1 to 5V</td><td rowspan="2">1.0mV</td></tr>
<tr><td>User range setting 2 (0 to 5V)</td></tr>
<tr><td rowspan="3">Current</td><td>0 to 20mA</td><td rowspan="3">0 to 4000</td><td>5μA</td></tr>
<tr><td>4 to 20mA</td><td rowspan="2">4μA</td></tr>
<tr><td>User range setting 3 (0 to 20mA)</td></tr>
</table>
</td><td>
<table>
<tr><th></th><th>Input Range</th><th>Digital Output</th><th>Max. Resolution</th></tr>
<tr><td rowspan="4">Voltage</td><td>-10 to +10V</td><td rowspan="4">0 to 4000 or -2000 to +2000</td><td>5mV</td></tr>
<tr><td>0 to 10V</td><td>2.5mV</td></tr>
<tr><td>0 to 5V</td><td>1.25mV</td></tr>
<tr><td>1 to 5V</td><td>1.0mV</td></tr>
<tr><td rowspan="4">Current</td><td>-20 to +20mA</td><td rowspan="4">0 to 4000 or -2000 to +2000</td><td>20μA</td></tr>
<tr><td>0 to 20mA</td><td>10μA</td></tr>
<tr><td>0 to 20mA</td><td>5μA</td></tr>
<tr><td>4 to 20mA</td><td>4μA</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Input range changing</td><td>Per channel</td><td>All channels in batch</td></tr>
<tr><td colspan="2">Offset/gain setting</td><td colspan="2">Yes</td></tr>
<tr><td rowspan="2">Accuracy</td><td>Ambient temperature 0 to 55°C</td><td>±0.4% (accuracy relative to maximum value of digital output value)</td><td>±1.0% (accuracy relative to maximum value of digital output value)</td></tr>
<tr><td>Ambient temperature 25±5°C</td><td>±0.2% (accuracy relative to maximum value of digital output value)</td><td>————</td></tr>
<tr><td colspan="2">Max. conversion speed</td><td colspan="2">1ms/1 channel</td></tr>
<tr><td colspan="2">Absolute max. input</td><td>Voltage ±15V, current ±30mA</td><td>Voltage ±15V, current ±30mA</td></tr>
<tr><td colspan="2">Number of analog input points</td><td colspan="2">4 channels/1 module</td></tr>
<tr><td colspan="2">Number of occupied I/O points</td><td>1 station occupied (RX/RY: 32 points each, RWr/RWw: 4 points each)</td><td>2 stations occupied (RX/RY: 32 points each, RWr/RWw: 8 points each)</td></tr>
<tr><td colspan="2">Connected terminal block</td><td>7-point, 2-piece terminal block (transmission, power supply) Direct-coupled, 18-point terminal block (analog input section) (M3 screw)</td><td>27-point terminal block (M3.5 screw)</td></tr>
<tr><td colspan="2">Applicable wire size</td><td>0.3 to 0.75mm^2</td><td>0.75 to 2.00mm^2</td></tr>
<tr><td colspan="2">Applicable crimping terminal</td><td>RAV1.25-3.5</td><td>RAV1.25-3.5, RAV2-3.5</td></tr>
<tr><td colspan="2">24VDC internal current consumption (A)</td><td>0.090</td><td>0.12</td></tr>
<tr><td colspan="2">Weight (kg)</td><td>0.20</td><td>0.35</td></tr>
<tr><td colspan="2">Outline dimensions (mm)</td><td>118 (W) × 50 (H) × 40 (D)</td><td>151.9 (W) × 65 (H) × 63 (D)</td></tr>
</table>

APP

(2) Precautions for replacing the conventional product (AJ65BT-64AD) with the AJ65SBT-64AD

In the existing system using the conventional product (AJ65BT-64AD), the following instructions must be noted when changing the AJ65BT-64AD for the AJ65SBT-64AD.

(a) Since the AJ65SBT-64AD occupies one station (the AJ65BT-64AD occupies two stations), the station information setting in the network parameters must be changed.

(b) As the remote I/O signals and remote register settings are different between the two models, the program of the conventional model cannot be utilized.

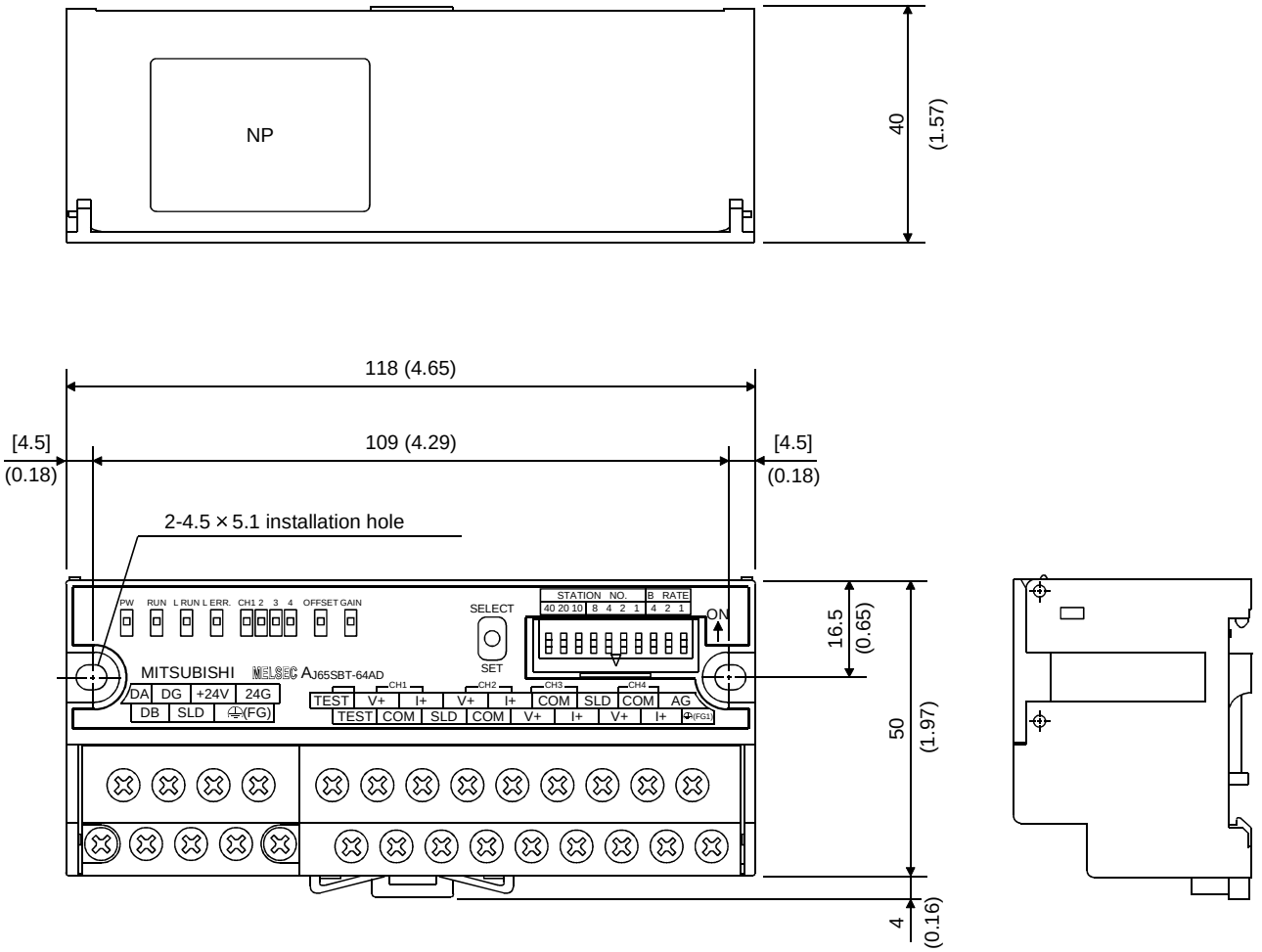
(c) Because of the differences in shape and layout between the terminal blocks, you cannot use the terminal block of the conventional module as it is.

(d) The offset/gain setting method differs. For details, refer to Section 4.4.

(e) The ways to set the station number and transmission speed setting switches are different. For details, refer to Section 4.3.

Appendix2 External dimension diagram

The outline dimension drawing of the AJ65SBT-64AD is shown below.



Unit : mm (inch)

MEMO

INDEX

[A]
A/D conversion completion flag 3-11
A/D conversion enable/prohibit specification 3-14
Absolute maximum input 3-2
Accuracy 3-2,3-6
Analog input 3-2
Analog input points 3-2
Applicable master modules 2-2

[C]
CC-Link dedicated cable 4-8
CC-Link dedicated instruction 2-2
Conversion speed 3-7
Current input characteristics 3-5

[D]
Data link cable wiring 4-8
Digital output 3-2
Digital output value 3-16
DIN rail 3-2,4-2,4-4

[E]
E^2PROM write error flag 3-11
Error reset request flag 3-12
Error status flag 3-12
External dimension diagram App-3
External power supply 3-2

[F]
Facing direction of the module installation 4-7
Function list 3-8

[G]
Gain value 3-3
General specification 3-1

[I]
I/O Conversion Characteristics 3-3
Initial data processing completion flag 3-12
Initial data processing request flag 3-11
Initial data setting completion flag 3-11
Initial data setting request flag 3-12
Input range changing function 3-8
Input range setting 3-15
Input range setting error 6-1
Internal current consumption 3-2

[M]
Maintenance and inspection 4-9
Maximum resolution 3-2,3-6
Module connection example 4-9
Moving average processing 3-9
Moving average processing count setting 3-16
Moving average processing specifying flag 3-12

[N]
Name of each part 4-3
Number of occupied stations 3-2

[O]
Offset value 3-3
Offset/gain adjusting LED 4-3
Offset/Gain Setting 4-5
Operation status display LED 4-3

[P]
Performance comparison between AJ65SBT-64AD and conventional product App-1
Performance specification 3-2
Pre-Operation procedure 4-1
Precautions for replacing the conventional product (AJ65BT-64AD) with the AJ65SBT-64AD App-2
Precautions when handling 4-1
Program examples for use of the QCPU (Q mode) 5-15
Program examples for use of the QnACPU 5-12
Program examples for use of the ACPU/QCPU (A mode) (dedicated instructions) 5-7
Program examples for use of the ACPU/QCPU (A mode) (FROM/TO instructions) 5-2
Programming procedure 5-1

[R]
Range error flag 3-11,6-1
Remote I/O signal list 3-10
Remote READY 3-12
Remote register allocation 3-13
Resolution 3-6

[S]
Sampling processing 3-9
SELECT/SET switch 4-3
Station number setting switch 4-4

[T]
Terminal block 3-2,4-4
Terminal number 4-3
Test mode flag 3-11
Tightening torque range 4-2
Troubleshooting 6-1
Troubleshooting for the case where the "ERR."LED of the master station flickers 6-5

[U]
User rage setting 3-4,3-5

[V]
Voltage input characteristics 3-4

[W]
Weight 3-2
Wiring 4-8

MEMO

WARRANTY

Please confirm the following product warranty details before starting use.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the dealer or Mitsubishi Service Company. Note that if repairs are required at a site overseas, on a detached island or remote place, expenses to dispatch an engineer shall be charged for.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not possible after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of chance loss and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to damages caused by any cause found not to be the responsibility of Mitsubishi, chance losses, lost profits incurred to the user by Failures of Mitsubishi products, damages and secondary damages caused from special reasons regardless of Mitsubishi's expectations, compensation for accidents, and compensation for damages to products other than Mitsubishi products and other duties.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

(1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.

(2) The Mitsubishi general-purpose programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or National Defense purposes shall be excluded from the programmable logic controller applications.

Note that even with these applications, if the user approves that the application is to be limited and a special quality is not required, application shall be possible.

When considering use in aircraft, medical applications, railways, incineration and fuel devices, manned transport devices, equipment for recreation and amusement, and safety devices, in which human life or assets could be greatly affected and for which a particularly high reliability is required in terms of safety and control system, please consult with Mitsubishi and discuss the required specifications.

Analog-Digital Converter Module type AJ65SBT-64AD

User's Manual

MODEL	AJ65S-64AD-U-S-E
MODEL CODE	13JR18
SH(NA)-080106-A(0010)MEE	

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : MITSUBISHI DENKI BLDG MARUNOUCHI TOKYO 100-8310 TELEX : J24532 CABLE MELCO TOKYO
NAGOYA WORKS : 1-14 , YADA-MINAMI 5 , HIGASHI-KU, NAGOYA , JAPAN

When exported from Japan, this manual does not require application to the Ministry of International Trade and Industry for service transaction permission.

Specifications subject to change without notice.